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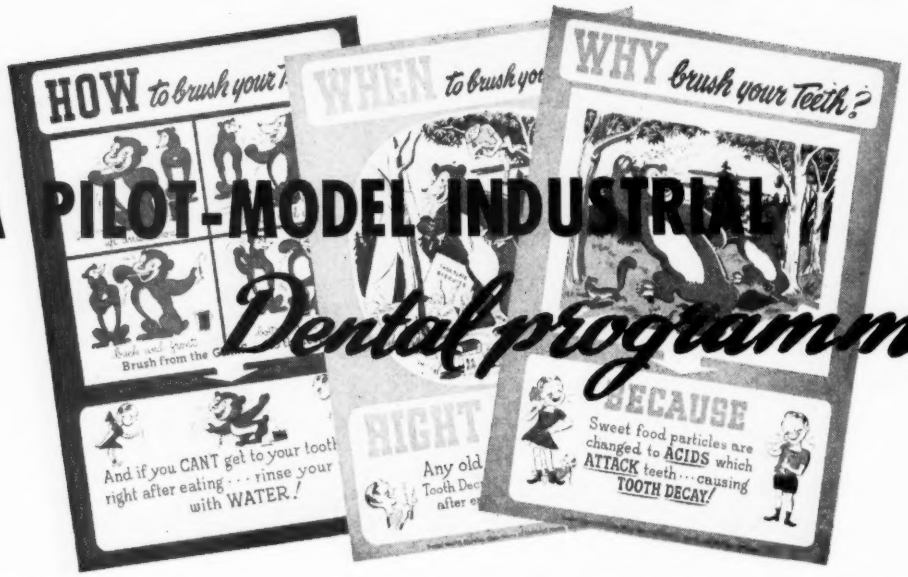

A PILOT-MODEL INDUSTRIAL *Dental programme*

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This study project grew out of a series of discussions with the Committee on Industrial Dentistry of the Canadian Dental Association. In 1946-47 this Committee worked with the Dental Health Division of the Department of National Health and Welfare in carrying out a survey for the purpose of obtaining information concerning industrial dental services in Canada and the attitude of Industry towards such services. The information obtained and the discussions concerning it led to a decision by the Department of National Health and Welfare to set up and operate, on a trial basis, a model of a purely preventive industrial dental service for a limited group of government employees of both sexes working in various capacities.

The Programme

A preventive dental service was set up in pilot-model form, for the purpose of gathering as much information as possible concerning the operation of a service designed to preserve oral health and function, and to learn something of the working relationships of such a service with the dental profession and with the general industrial health program.

Accommodation

Accordingly, a space, approximately 15'x18' located on the first floor of the Jackson Building Annex, was used as the site for the dental health service. This space was divided into two dental examination-operating rooms, a small supply room, a dark-room and a records-office.

Equipment

The equipment used was selected with a view to determining the best compromise between the types used in a permanent location, and the type which might be used by the same personnel in a number of locations.

Standard dental chairs were set up, but surgical cuspidors and mobile dental engines were used instead of complete dental units. Auxiliary mobile type instrument cabinets, hospital instrument tray stands and a mobile dental X-ray unit were selected because they could be easily moved from place to place and would not require special installation.

Both examining rooms were equipped with instruments and supplies necessary for routine dental inspections and prophylactic services; special operative surgical and diagnostic instruments were also provided.

Records

Records were of two types: A "Dental Record" for recording findings from routine dental inspections, prophylactic services rendered, and other relevant facts, and a "Dental Examination and Case History" form on which the dentist's findings and diagnosis during clinical investigation of a patient's dental problems were recorded.

Result of radiographic investigations were recorded on an "X-ray Report" which was filed with the patient's other records. Both X-rays and information concerning them, were available on request to the patient's own physician and dentist.

Other records consisted of a "Daily Record" and a "Monthly Record" for summary purposes, along with a "Recall" card index system.

Personnel

Shortage of dentists and dental hygienists made it necessary to operate with only one dentist and one dental hygienist.

Nature and Scope of Services

Services included:

(a) Periodic dental inspection, supplemented by bite-wing X-rays for doubtful cases.
(b) Semi-annual prophylaxis.
(c) Dental Health Counselling.
(d) Complete dental examination and diagnosis if indicated.
(e) Palliative treatment, and
(f) Referral for emergency dental treatment.

The functions of the hygienist included oral inspections (preplacement, regular and request), prophylaxis, counselling, referral of patient to the dentist, and preventive measures within the scope of her skill and training.

The clinical supervisor (dentist) was responsible for general supervision of services, handling of cases beyond the skill of the hygienist, diagnoses where necessary, treatments (non-surgical) for pain relief, and many of the same clinical functions as the hygienist, depending on the situation. The dentist also maintained close liaison and a consultative relationship with local dentists. The programme and its relationship with local dentists was thoroughly discussed with the Executive Committee of the Ottawa Dental Society and received the full official support and co-operation of both the committee and the local dentists.

Expansion and Development of the Programme

When the programme was first launched in November 1950, it was decided that it's services should be available only to civil servants working in the Jackson Building, comprising a total of 1300 persons. However, in May 1951, it was extended to other civil service groups in other government buildings and from September 1951, until the programme was discontinued in June 1952, more than 4,000 civil servants were eligible to participate.

The dental hygienist left the programme at the end of August, 1951, to teach at the University of Toronto, and during the remaining ten months the supervising dentist was assisted part-time by a qualified dental nurse, and two young women were employed for varying periods of time as clerk-assistants.

Services Provided by the Programme

During the twenty months of operation, a total of 2,722 visits were made to the Dental Centre. Of this number, 1,294 persons requested one or more of the programme services. 954 requested periodic dental inspection and prophylaxis, 553 persons received initial services, 267 made two voluntary visits to the Centre, 128 made three visits and 7 reported for their third voluntary "recall" inspection and prophylaxis.

599 cases were referred to the supervising dentist for complete dental examination, by the dental hygienist, the Civil Service Health Division, private dentists and physicians.

551 persons required dental treatment for specific dental conditions and were referred to private dentists following investigation of the complaints.

467 patients had dental X-rays involving the taking of 1,964 plates. 88 cases were given emergency treatment and 157 received "other" dental service, including post-extraction care, relief of denture sores, and temporary restorations.

Dental inspections, dental prophylaxis and dental health counselling constituted the greater part of the services provided by the programme.

Comments on Evaluating Industrial Dental Preventive Programmes

The effectiveness of medical services in industry readily can be assessed in terms of their effect in reducing absenteeism, lowering accident rates and compensation costs, and increased production. Through

the use of such criteria the value of medical services can be expressed in dollars saved by industry.

It would be very difficult to measure the effectiveness of industrial dental preventive services by these criteria. Diseases of the teeth and gums are rarely listed as the common causes of industrial absenteeism due to illness; doubtless, this is partly due to the fact that dental disorders frequently involve part-day absenses that are not reported. Most dental causes of industrial absenteeism are non-occupational, and therefore are not compensable. Few data are available concerning the effect of dental disease upon industrial production.

The industrial dental preventive program aims at assisting the employee to conserve and to improve dental health by making readily available to him facilities for early diagnosis, periodic prophylactic services designed to prevent periodontal disorders, a ready source for advice and counsel regarding good habits of diet and oral hygiene practices, and continuing encouragement to seek regular and timely dental care. In addition, facilities are provided for the prompt, emergency relief of dental pain. This makes possible a broad coverage of employees which would be impossible with the same dental hours if a restorative program were to be undertaken, and does not involve a large supply and laboratory expense.

Problems of Obtaining Coverage

Normally a dental preventive clinic providing the services described above, operates on the basis of a 6 to 7 hour day, with half-hour appointments. On the average, about 12 patients per day can be handled by either the dentist or the hygienist for normal preventive services, if employed full time in the clinic. However, it cannot be too strongly emphasized that some of the most valuable services rendered by the supervising dentist, and at times by the hygienist, are performed outside the confines of the clinic. Organizational and promotional work among supervisors and employees, group education efforts, reports, liaison and conferences with the medical services and the local dentists, and study of possible oral health hazards related to the industry involved, etc., are all essential and valuable functions of a dental preventive service. While the patient turnover should be kept as high as full time employment of the dentist and his staff will permit, this should not be the sole basis of evaluating the service.

Benefits of Dental Preventive Program in Industry

Today's concept of industrial health services concerns the total health of the employee. The increasing awareness of the importance of dental and oral diseases as an individual and a community health problem, warrants the inclusion of dental preventive services as an integral part of the industrial health program, if maximum effectiveness in maintaining health is to be achieved.

More than nine of every ten adults have defective teeth and/or periodontal disorders. While the contribution, both direct and indirect, made by dental and oral diseases to general ill-health, disability, lowered physical efficiency and sickness absenteeism is not readily measurable, there can be no doubt that it is enormous. An indication of its magnitude and relative importance may be derived from statistics on the Canadian Sickness Survey, 1950-51, which show that direct payments made to physicians for the treatment of all other disorders were only slightly more than 2½ times the amount paid directly to dentists for treatment of oral conditions alone.

To a considerable extent, these diseases and their sequelae are preventable. Facilities for the early recognition of dental and oral disease together with periodic, regularly performed preventive measures can be the means of preventing the onset of acute dental and periodontal disorders, or the development of chronic oral conditions, which lead to ill-health, chronic fatigue, and recurrent absenteeism.

In addition to the time lost from work because of

dental pain and infection, there is the time required for corrective, surgical or restorative dental treatment, after the acute symptoms have been relieved. For example, an employee might lose as much time from an absessed tooth as from a common cold. Furthermore some form of dental treatment will be required following subsidence of the original condition to prevent its recurrence, whereas a minor respiratory infection usually involves no additional absence from work for after-care. The services provided by the industrial dental preventive program can help to reduce the amount of working-time so lost.

In industries where occupational hazards to dental and oral health exist, the dental preventive and educational program can accomplish much towards controlling the effects of both physical and chemical hazards. In such industries, experience has shown that the inclusion of dental health services in the health program leads to reduced cost for treatment of dental and periodontal disease of occupational origin.

The benefits thus far listed are tangible. To them must be added the somewhat less tangible, but equally important effects on employee good-will that accrue from the availability of competent dental health advisory services.

Planning and Organization

For successful development, the objectives of the industrial dental program should be fully understood and supported by three groups; management, labour and the local dental profession. Each group should be consulted during the early stages of program-planning. The experience of the pilot-model showed that by far the quickest and greatest patient-response came from the groups where "management" and "employee" worked together to arouse interest. Also, special attention should be given to the problem of arousing the interest and encouraging the participation of persons who are disinterested in their own dental health, because these are the people who no doubt could benefit most from the program.

In the early stages of the pilot-study, only a few visits were made to the clinic by persons whose interest was motivated by other employees who were periodically requesting dental inspection and prophylactic services. This number increased as the study progressed.

Some Conclusions Regarding Qualifications of Personnel

The personnel for a dental preventive service should include a dentist-in-charge, and a dental clerk-assistant. Where the group is large enough to warrant it, a dental hygienist should be added in preference to a second or additional dentist. However, dental hygienists are ancillaries to the dental profession, and are not trained to operate such a service without the direction of a dentist supervisor. Whether all three, or any one of the three should be employed full-time, or part-time, will depend on the number of employees participating, and upon the scope of dental services provided.

A dental preventive service should be integrated with the over-all industrial health program, but under the professional administrative direction of the dentist-in-charge.

The dentist-in-charge should be in good professional standing in the community, and capable of fostering good relationships with other community dental and medical services. He should be aware of the actual or potential hazards to dental health in the plant and should be trained to recognize and treat the effects of such hazards. Special training in oral diagnosis, the ability to correlate dental and medical findings, skill in dental education and counselling are also essential for optimum efficiency of the program.

The dental hygienist should be a well-trained graduate of a recognized school for hygienists. She is

not qualified to carry out any diagnostic functions. However, under the supervision of the dentist, she will be required to perform a "screening" type of dental inspection, limited to the observation of dental caries experience, the reporting of obviously abnormal oral conditions which require further clinical investigations, oral hygiene status, etc. The dental hygienist also may attend to the technical procedures involved in radiographic examination, but she will not be responsible for interpretations of X-ray films. The two most important functions of the hygienist are the performance of routine dental prophylactic services and the advising and counselling of patients in matters of diet, habits and practices of oral hygiene, as well as stimulating individuals to seek timely dental care.

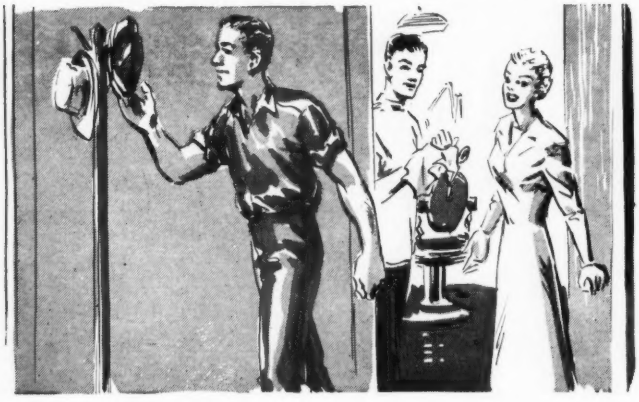
The dental hygienist will rarely require chair-side assistance, as such. However, the employment of a clerk-assistant to attend to the "house-keeping" details, the arrangement of appointments, reception of patients, sterilization of instruments and "clean-up", processing of X-rays, maintenance of records, and clinic correspondence will permit the hygienist to devote all of her time to her proper functions.

Facilities and Equipment

Space allocated to the dental centre should be adequate for the carrying out of its functions, according to generally accepted standards. Ideally, it should be located in the health unit area, and should consist of at least two operating-rooms, a dark-room, a supply-cupboard and a records office. Waiting-room and recovery-room facilities should be provided; where feasible these facilities may be shared with the health unit. Lighting and ventilation are of considerable importance, the latter particularly so in view of the close quarters at which most dental procedures are performed. If the clinic is situated in a noisy area, the walls should be sound proofed.

The minimum size for a practical dental operating-room is 7' 6"x10'. It is estimated that facilities as listed above would require about 18'x20' of floor space.

Equipment, instruments and supplies should be adequate, both in quality and quantity, to meet the



general standards of dental practice. Fancy, "super-deluxe" equipment is not necessary—in fact it would be an unwarranted extravagance. Whether the major items such as chair units, instrument cabinets and X-ray equipment are fixed installations or portable will depend upon such factors as whether a full-time service in one location is planned, or if service is to be provided in more than one location.

Nature of Service

A preventive dental program should provide at least the following services:

1. Pre-employment examination
2. Periodic (semi-annual) dental inspection
3. Periodic (semi-annual) dental prophylaxis
4. Dental Health education and counselling
5. Dental diagnosis and consultation
6. Emergency and palliative dental treatment

(This may need to include emergency extraction etc., if this service is not available from the local dental profession).

Pre-Employment Examination

Generally speaking, voluntary, rather than compulsory, participation in an industrial dental preventive program is probably the preferable course. However, there are advantages in making both dental and medical pre-employment examinations compulsory. If there is a compulsory pre-employment medical examination there should also be a dental examination.

The new employee should receive a thorough dental examination by the dentist-in-charge, in order that a complete case-record of his previous dental history and present dental condition may be obtained. This information is essential for completeness of the health service records of the new employee. The pre-employment examination serves a still more important purpose in that it provides an opportunity for the dentist or dental hygienist to stimulate the employee's interest by showing him how the program can assist him to maintain good dental health.

A complete clinical examination, complemented by full-mouth and bite-wing radiographic investigation, should be performed and carefully recorded. Dental findings should be correlated with the findings of the general physical examination, in order to get a complete picture of the new employee's general state of health. Every effort should be made to encourage him to visit a dentist of his own choice for any required dental treatment.

Importance of Periodic Dental Inspection

Employees should be encouraged to report at least twice a year for dental check-ups. In industries where specific or suspected dental hazards exist, even more frequent check-ups of employees' dental conditions should be made.

The periodic dental inspection can be performed by the dental hygienist, immediately following the performance of prophylactic services. Bite-wing radiographic surveys, of the posterior teeth at least, could be done routinely. The hygienist should refer all cases of obvious or suspected dental abnormalities to the dentist for investigation and diagnosis.

Properly carried out, the "screening" inspection by the hygienist or the dentist will serve not only as a check on the employees' oral hygiene status, but also will assist in the early discovery of dental and periodontal disease.

Importance of Periodic Dental Prophylaxis

Dental health education should be related to the over-all health education program conducted by the industrial health service. The periodic visits of employees to the dental centre for check-up and prophylaxis, however, afford an opportunity of following up the general program of dental health with individual counselling. Thus, dental health education can be personalized and related directly to the employee's own

dental problems, needs, and his own knowledge of his condition.

Examination and Diagnosis by the Supervising Dentist

Complete facilities for diagnosis and consultation with the dentist-in-charge should be available on request by the employee himself, upon referral by the industrial health service medical department, or if indicated by what "screening" inspections might bring to light.

Emergency and Palliative Treatment

Prompt emergency treatment of job-related dental injuries, and the relief of pain of dental or oral origin should be quickly available to employees. In the average industry, a violent toothache or pain from periodontal inflammation is sure to cause lowered efficiency. Unless facilities exist whereby the sufferer can obtain prompt relief, he must either stay on the job and suffer, or perhaps lose several hours from work while obtaining relief. Most such cases, if dealt with in the plant's dental centre, would entail only a few minutes absence from work.

The scope of palliative services available from the dental centre should be clearly defined, and should be approved by the dentists practicing in the neighbourhood. If the removal of a tooth is clearly the only solution to the employee's immediate dental problem, it would be preferable to refer him immediately to his own dentist, if possible. However, if the employee has no regular dentist, or if circumstances do not permit him to visit his own dentist, necessary extraction of teeth should be done by the industrial dentist. In all such cases, any local dentist or physician who may be concerned is entitled to be advised, both as a professional courtesy and in the interest of the patient.

Not infrequently, the dental centre will be visited by employees desiring post-extraction care. Permission to give such care should be obtained from the dentist concerned, and should be given according to his directions. A written report of any such treatment provided should be sent to the employee's dentist.

Referral Service

Routine operative, surgical and prosthetic dental services normally have no place in the list of services available to employees from the industrial dental preventive service. An important function of the program, however, is to encourage employees to obtain necessary dental treatment as early as possible. If such treatment is not sought—or not obtainable—the benefits of early diagnosis will be nil, obviously.

Therefore, it is of the greatest importance that a good working relationship be established between the dental program and local dentists.

Some arrangement for the referral of employees who have no regular private dentist should be made with, and approved by, the local dental society. The industrial dental service should avoid laying itself open to the charge of referring too many patients to any one dentist in the community. Any problems of this sort can be prevented by asking the society to furnish a list of local dentists willing to accept such patients and then encouraging the employee to select the dentist of his choice from this list.

Another possible problem is the question of referring an employee to a specialist for indicated consultation or treatment. If, however, he is regularly the patient of one of the dentists in the community, professional courtesy requires that either the employee be sent to his own dentist for referral, or the private dentist be consulted by the dentist in charge of the preventive service concerning the referral of the employee to a specialist. It is imperative that nothing be done to affect existing relationship between patient and private dentist.

Conclusions

1. Industrial dental services are in the course of taking on the same type of preventive aspect as that assumed by general industrial health services.
2. A preventive service is capable of a broad employee coverage and offers effective health services.
3. It offers many opportunities for correlation with general industrial health services, and with private dentists, with whom a mutually satisfactory working relationship is quite practicable, if steps are taken beforehand to explain to them the functions and aims of the program.
4. The industrial and office worker will accept and use a preventive service, but the rapidity of its adoption and extension depends not only upon the ability and acumen of the supervising dentist in encouraging its use but also on the degree of interest and co-operation shown by administrative heads and sub-heads throughout the industry, and also upon the good-will of the local dental profession.
5. Like any other department of the industry it must be busy all the time if it is to pay its way and provide maximum dividends.
6. The industrial dentist should have special qualifications. His chief interest should be in the practice of preventive dentistry. His relationship with industrial medicine calls for an expansion of his knowledge into this and related fields. He must have the confidence of the local dental profession.
7. Where the group is sufficiently large to require more service than can be rendered by the dentist, the Dental Hygienist is a very effective ancillary, and is to be preferred over employing a second or additional dentists. She should be a competent counsellor in addition to being able to render prophylactic services.

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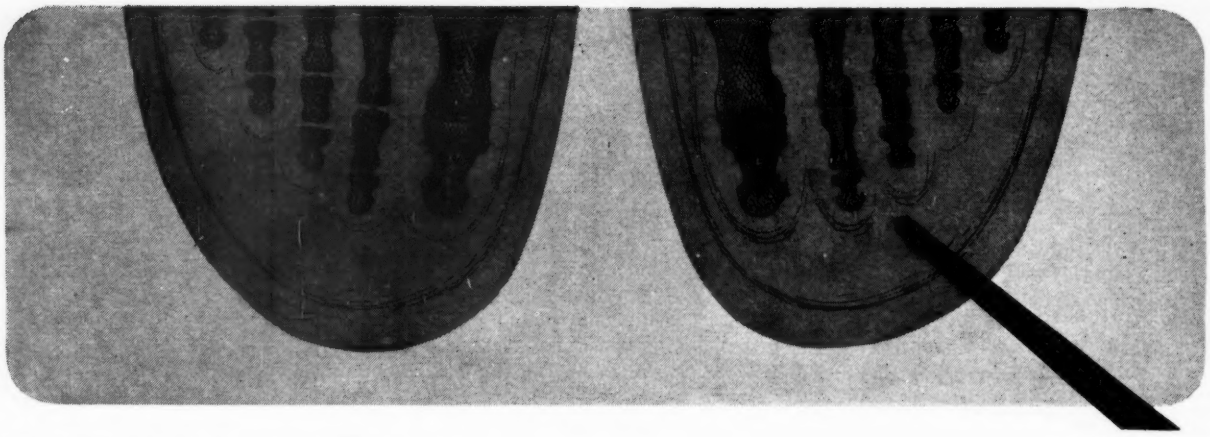

THE REGULATION OF SHOE FITTING FLUOROSCOPES

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Introduction

Shoe fitting fluoroscopes have recently been receiving a good deal of attention. Articles about them have appeared in technical journals and popular magazines. A number of states and cities in the United States have adopted means of regulating their use, and one Canadian province has issued recommendations for their safe use.

This review of regulations and recommendations has been prepared in response to a number of requests for information about these devices.

The Problem

Most authorities believe that exposure to ionizing radiation should be reduced to the lowest possible level. They feel that all unnecessary exposure should be eliminated, and that necessary exposures should be kept to the minimum. They point out that in most cases modifications can be made so that the desired result can still be obtained with smaller outputs of radiation, resulting in smaller doses to the individual.

The purpose of this paper is

(1) to show the nature of the hazards which may be associated with shoe-fitting fluoroscopes, and

(2) to discuss the various means by which they can be made to operate under conditions that are considered safe for necessary exposure.

How the Problem was Approached

In 1946 the Department of Health of New York decided to obtain some facts about the conditions under which these machines were operated. A survey was made, and it indicated that there was a considerable hazard, both to shoe store employees and to customers having their feet X-rayed. In only a few cases were the people in charge of the equipment at all aware of the potential danger of repeated exposure to excessive radiation.

As a result of this survey, regulations for the safe use of the machines were adopted. Other cities and states have subsequently confirmed the potential hazard from the use of shoe fitting fluoroscopes, and some of them have taken steps to remedy this hazard.

The reasoning for the regulations and the way in which they have been enforced will now be described.

The Nature of the Hazards

The hazards can be divided into two types:

A. Those which primarily affect the customer.

B. Those which primarily affect the sales staff.

A. The Hazard to the Customer:

Here we are concerned with the effects of a direct beam of radiation on a localized part of the body, in this case the feet and legs.

The International Commission on Radiological Protection recommended in 1950 that the exposure to a localized area of the body should not exceed 1500 milliroentgens per week. This is equivalent to a total of 78 roentgens in a year. But the Commission made it very clear that this figure is to be considered as a maximum, and that exposure should be maintained at a much lower level. It should be emphasized that the dose of 78 roentgens refers only to exposure of the feet, and not to whole body exposure.

The early surveys of shoe fitting fluoroscopes showed outputs averaging from 30 to 40 roentgens per minute to the feet. It is obvious that at this rate a cus-

tomer's feet could receive a year's maximum dose in two or three minutes of exposure. Many of the customers were having examinations of greater length than this.

When it was found that the output of the machines was so high, the next question was to find out if the dose to the feet could be reduced, without detracting from the brightness of the fluoroscopic image. Experiments were conducted with a number of machines to find out the lowest output that would produce a satisfactory image. This study showed that a beam intensity of 12 roentgens per minute, as measured at the position of the feet, was sufficient to produce a satisfactory image in all but extremely thick soled shoes. The maximum permissible beam intensity has been based on this value. For women and children a lower beam intensity is quite satisfactory, and is therefore desirable.

Control of the Hazard to the Customer

(1) Beam Intensity.

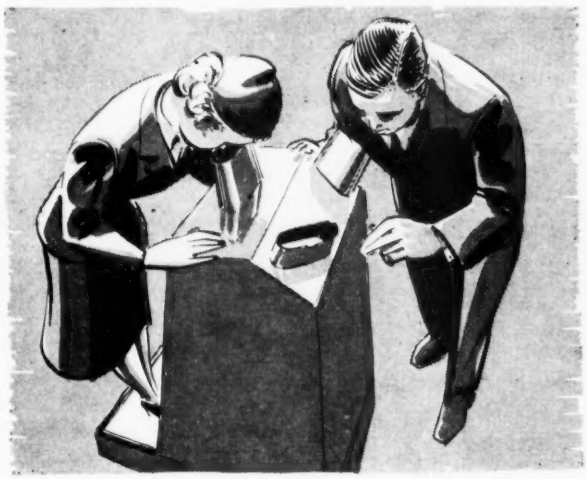
We have seen that the beam intensity should not exceed 12 roentgens per minute for men's feet, and should be less for women and children. The figures for the latter are 10 roentgens per minute and 8 roentgens per minute respectively. A control means should be provided on the machine to make fittings at each of these three intensities.

(2) Timer.

Most competent shoe salesman believe that five seconds is ample time in which to note the fit of a shoe. Machines should therefore be fitted with a timer which will limit the viewing time to five seconds.

(3) Number of Viewings.

Three viewings should be adequate to select a pair of shoes, and four pairs of shoes is a generous yearly average. On this basis it is possible to recommend that the number of viewings be limited to three in one day, or twelve in a year. A person who was subjected to twelve viewings, each for five seconds, at twelve roentgens per minute would therefore receive a total of twelve roentgens. As we have seen, this is within the yearly maximum limit of seventy-eight roentgens.



(4) Filter.

With any X-ray beam there is a certain proportion of rays of low energy. These do not play any useful part in forming the fluoroscopic image, but they do add to the radiation dose received by the feet. An aluminum filter, 1 mm. thick, should be placed between the feet and the X-ray tube to cut out these low energy rays. These filters are commonly placed on the floor of the foot opening. Care should be taken to ensure that the aluminum is not part of the wearing surface of the floor, as this metal quickly gets worn thin by the shoes. It should therefore be protected with a piece of material such as linoleum or rubber, but should be installed so that its thickness can be easily determined.

(5) Viewing Screen.

In order to produce a satisfactory image under the conditions which have already been discussed, it is essential to have a good fluoroscopic screen. Old screens do not produce a bright image, and to compensate for this, many operators increase the output of the machine to unnecessarily high levels. To avoid having to do this, the screen quality should be equivalent to a Patterson No. B-2. It should be covered with leaded glass having a lead equivalent of at least 1.5 mm. lead for 65 kvp.

(6) Safety Switch.

Only authorized sales persons should operate the machines. To make it difficult for others to do so, the starting mechanism should be fairly complex.

(7) Warning Sign.

In order to educate customers and sales personnel about the hazards of these devices, it is advisable to post a warning sign in a conspicuous place. A suggested wording for such a sign is:

WARNING

EXCESSIVE EXPOSURE TO X-RAY IS HARMFUL. SHOE FITTINGS SHOULD BE LIMITED TO 3 PER DAY, AND NOT MORE THAN 12 PER YEAR. SHOES MUST BE WORN ON BOTH FEET DURING A FITTING.

CUSTOMERS MUST NOT OPERATE THIS MACHINE.

It should be the duty of the salesman to draw each customer's attention to this sign.

(8) Miscellaneous.

Customers should always wear shoes on both feet while undergoing fluoroscopy. The shoe itself reduces considerably the amount of radiation received by the foot.

The salesman should question the customer about the number of fluoroscopic fittings received during the past year. If it is evident that the recommended number has been exceeded, the salesman should advise against using the floroscope until a later date.

B. The Hazard to the Sales Staff.

We will now consider the problem of the hazard to the employees of the shoe store. Here we are concerned with repeated chronic exposure to small amounts of radiation.

The Nature of the Hazard:

This will be discussed under three headings:

1. Primary or "direct" radiation.
2. Secondary or "scattered" radiation.
3. Electrical hazards.

(1) Direct Radiation.

This should not be much of a problem in the case of employees. It arises when an employee views the bones of his own feet or arms, either for demonstration or testing purposes, or to satisfy his curiosity. Direct radiation may present a hazard in some of the older shoe fitting machines, in which the X-ray tubes were not always properly shielded.

(2) Scattered Radiation.

Scattered radiation is a much more important source of hazard to the employee than is direct radiation from the primary beam. Scattered radiation is caused when the direct beam strikes an object and is reflected from it. In the case of shoe fitting machines, the primary beam is scattered from parts of the machine itself, and also from the customer's feet. The scattered rays will escape from any unshielded openings, such as the aperture for the feet, the viewing ports, and any other unintentional apertures such as cracks, holes, etc.

(3) Electrical Hazard.

These machines operate at around 50,000 volts, and present a very considerable electrical hazard. At this voltage a spark can jump 2 to 3 centimetres. The problem consists of two parts: (a) Internal grounding and (b) Installation grounding.

Control of the Hazard to the Employee

1. Primary Radiation.

(a) The operator should never use his own feet or hands for demonstration purposes; neither should he or anyone else hold a child's feet in position while the machine is in operation.

(b) The fluoroscopic screen should be covered with leaded glass having a lead equivalent of at least 1.5 mm. of lead.

2. Scattered Radiation

(a) The machine must be constructed in such a way that radiation is reduced to 12.5 milliroentgens per hour at all positions within 6 inches of the cabinet, and at the viewing ports at eye level. An exception is made in the case of the foot opening.

(b) Foot Opening. It is practically impossible to shield the foot opening to conform to the above standard. Using leaded rubber curtains around the opening it is readily possible to reduce scattered radiation to 12.5 milliroentgens per hour at a distance of 10 feet from the foot opening. This means that the machine must be located so that the foot opening is not directed towards areas normally occupied by sales staff. At any rate, no employee should work regularly within 10 feet of the foot opening.

2. Electrical Hazard.

The machines must be grounded in accordance with electrical codes. Special attention should be paid to internal grounding and installation grounding.

An interlocking switch should be provided on any door or panel giving access to high voltage components. The switch breaks the electrical circuit whenever the container is opened. It guards against electrical shock and also against radiation which might be received while the X-ray tube is directly exposed.

The recommendations made in this paper are taken chiefly from "A Guide for Uniform Industrial Hygiene Codes or Regulations for the Use of Flouroscopic Shoe Fitting Devices," issued by the American Conference of Governmental Industrial Hygienists in 1951. The majority of the State and City Codes in the United States are based on this Guide, though some of them have made alterations and additions.

(concluded page 31)

THE ROLE OF TRAUMA IN ARTHRITIS

Wm. J. McCracken, M.D., Ontario Workmen's Compensation Board

The role of trauma in the production and/or aggravation of arthritis represents a vast and controversial field in Medicine, and only certain phases of the subject will be discussed herein. The material presented is based on experience with cases passing under the care of the Ontario Workmen's Compensation Board. The following are some of the conditions encountered which require careful investigation for accurate diagnosis:

(1) Degenerative Arthritis of the Spine

This represents the greatest number of arthritis cases seen by the W.C.B. It also represents one of the most difficult problems in attempting to assess the Board's responsibility.

This disease is present in a high percentage of people over the age of 35 years, and yet we estimate that close to 80% of all cases are essentially asymptomatic. Therefore it would appear that radiological changes of the spine are proof of degenerative disease, but have no correlation to the presence of disabling back symptomatology.

The usual story in the cases seen at the W.C.B. is that of a middle aged worker who injures his back due to a blow, slip, fall, unusual lifting strain or twist. He becomes disabled due to back pain. X-rays are taken by the attending surgeon and degenerative disease of the spine is noted by the radiologist. The surgeon then sends us a report stating that the man is suffering back pain from arthritis of the spine, brought on by injury.

This constitutes a very interesting problem. We admit that trauma may act to aggravate an osteoarthritic spine, and thereby give rise to back pain. However, we are also convinced that in a reasonable percentage of these cases the radiological discovery of degenerative disease is merely coincidental. We prefer to consider these cases as low back pain due to soft tissue strain and sprain. In any event the treatment is initially the same, and if recovery occurs within 4–12 weeks no great problem is encountered.

Three types of cases present problems as to degree of our responsibility as related to the compensable accident.

(a) There are those cases which continue to have back pain and remain disabled for prolonged periods of time. This problem necessitates separating the portion and degree due to the injury from the like portion and degree due to the pre-existing degenerative process.

It has been suggested that, in the absence of fracture, dislocation or clear-cut disc disease, these cases be treated as a soft tissue low back strain. Accordingly, compensable responsibility should be terminated at an arbitrary time limit of 6 months, or when the cases have returned to their pre-accident status, whichever occurs first. I may add here that most of our cases in which

*Presented at the Joint Conference of the Industrial Section of the Ontario Medical Association, and the Industrial Medical Association of the Province of Quebec, Ottawa Civic Hospital, September 23, 24 and 25, 1954.

an adquate accident has occurred, are carried on far beyond this point.

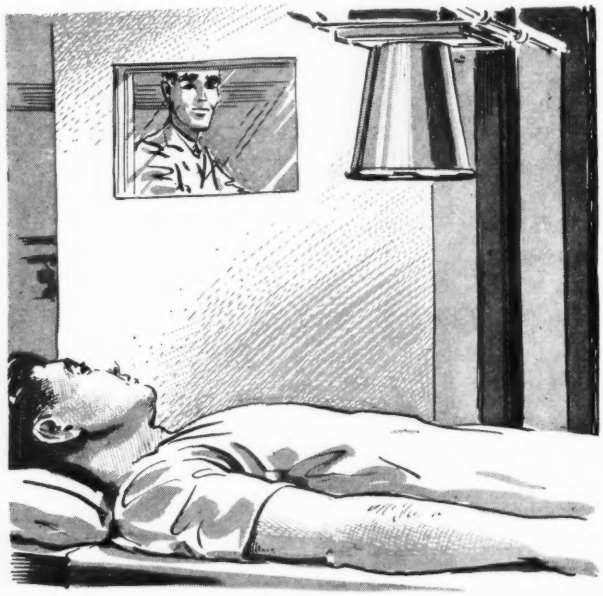
(b) The second type of difficult case is where the workman recovers with minimal back discomfort and returns to work. At a later date (6–36 months) he becomes disabled again, without subsequent accident, due to back pain. He or his physician attributes this disability to his compensable accident. In the vast majority of these cases we feel that the relationship to the accident is remote and we do not accept further responsibility.

(c) There is a small third group which should be added here. This group becomes considerably larger when disc cases (operative and non-operative), spondylolisthesis and fractures are included.

This group is represented by the elderly workman who recovers to a degree only. Due to his residual disability, age, the general labour market, etc., he never returns to work. In effect his working days have been shortened. This is due to a speeding up of wear and tear phenomenon, resulting in his retirement from the labour market one to five years prematurely. This factor is taken into consideration and the Board accepts a limited degree of continuing responsibility.

(2) Fractures of the Spine with Localized Arthritic Change

We see considerable numbers of these cases, usually in the final static phase, three to five years following injury. They are mainly compression fractures of lumbar and lower dorsal vertebral bodies. There are a few fractures of the articular pedicles and transverse processes. The usual case continues to have minimal to moderate back pain without great deformity.



He is unable to do heavy labour, despite the fact that he is a relatively young man. In most instances his initial treatment has been proper and adequate. X-rays of the spine show a localized degenerative process with spur formation and incomplete bony bridging of the anterior inter-vertebral space in the region of the annularis. On radiological examination, the remainder of the spine is found to be free of evidence of degenerative change.

Fractures of articular pedicles and transverse processes which go on to non-union, or fibrous union are a cause of pain. They will show proliferative changes about the fracture line. Degenerative disease involving the articular facets of the offending vertebra is also noted.

These all represent direct sequelae to the injury and our responsibility is evident.

(3) Marie-Strumpell Spondylitis

It is of interest that we see so few of these cases. This may be due to the fact that these people are not engaged in heavy industry, because of their disease. Another possibility is that a case, which has run its course and has become static is less prone to back strain due to the auto-fusion which has already occurred.

We see the occasional case of early spondylitis with a low back strain but by and large these do not tend to become chronically disabled as a result of accident. We concede that adequate injury will play the role of an aggravating factor in the early stages of the disease, but we are not convinced that it speeds up the disease materially.

(4) Post-Traumatic Arthritis

In this category arthritis occurring in joints other than the spine will be considered.

In fractures of bones adjacent to joints, traumatic arthritis supervenes if the fracture passes into the joint with displacement of part of the articular surface, or, if the fracture disturbs the joint dynamics due to bony deformity.

Excellent examples may be found following comminuted fractures of the os calcis with distortion of the subastragaloid joint space. An example of upset joint dynamics is found in malunion of the tibia with angulation and resultant arthritic change in the ankle joint. Another two joints especially prone to traumatic arthritis are, the knee joint following fractures of the tibial plateau with distortion and depression of the fragments, and, the ankle following trimalleolar fractures.

Arthritis of joints, such as the elbow, is occasionally seen following dislocation and is usually associated with calcification in a subperiosteal haematoma and loose bodies in the joint.

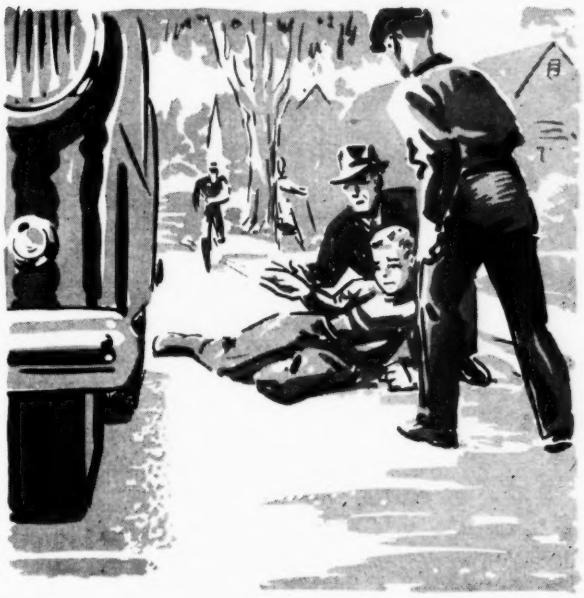
Arthritis of the knee joint following meniscectomy is fortunately rare, but does occur. The arthrotomy tends to speed up an early pre-existing osteoarthritis,

in these cases, rather than to cause a true traumatic arthritis.

We are unable to attribute any cases of traumatic arthritis to repeated minimal trauma, or continued excessive strain on the joint, except where the joint dynamics are disturbed as previously mentioned. Possibly the closest entity to this is the so-called "Moulders Back." Here, however, the lesion is degenerative arthritis speeded up due to excessive wear and tear phenomenon as a result of occupation.

(5) Arthritis of Aseptic Necrosis (Keinbock's Disease, Legg-Perthes, Osteochondritis Dessicans, traumatic dead head of femur).

There are numerous cases of Keinbock's disease with associated traumatic arthritis. This always represents a pre-existing condition, aggravated by a twist or sprain to the wrist. In these cases, trauma may



act as the final precipitating factor in the development of a painful wrist. Trauma has no influence on the disease rate, nor on the arthritis present. However, the trauma may cause collapse of the diseased semilunar with resultant increase in the associated arthritis.

Occasionally aseptic necrosis following anterior dislocations of the semilunar is found. This condition is always the cause of traumatic arthritis in the offending wrist joint.

One case of Legg-Perthes disease has been brought to my attention. This young man had developed a painful hip at the age of eleven years and, following the investigation, a diagnosis of Legg-Perthes diease was made. He was not confined to bed, and represents one of the cases which became pain-free. He carried on without symptoms till the age of sixteen, when he was involved in an accident. He received a blow of considerable force to the region of the greater trochanter. He developed a painful hip and was disabled for a period of eighteen months. The hip joint showed the pre-existing femoral head deformity with associated traumatic arthritic changes. Over the one and one-half year period the X-ray picture remained unchanged. He finally became painfree and at present is able to walk five miles without discomfort.

Osteochondritis Dessicans—Trauma plays a very minor role in the production and exacerbations of this condition. The usual lesion is restricted to the non-weight bearing portion of the femoral condyles and antedates the injury. The only direct result of trauma is when the diseased area is separated at the time of injury and becomes a loose body in the joint, with resultant joint locking and effusion. Occasionally traumatic arthritis develops as the end result of an old osteochondritis in which the loose body has not been removed by arthrotomy.

Periodically we encounter cases of osteochondritis involving the humeral capitellum, and the lateral portions of the superior articular surface of the astragalus. These have been related to definite trauma and may eventually result in the development of a traumatic arthritis.

Dead head of femur—Following posterior dislocation of the femur from the acetabulum there is interference with the blood supply to the head. This is due to trauma with thrombosis of the vessels running along the capsule of the joint. As accurately as can be estimated, 15–25% of these cases develop a dead femoral head. If this condition is not recognized, then fragmentation of the head occurs from continued weight-bearing, and a painful traumatic arthritis develops. In several of these cases the arthritic process had involved the acetabulum to such a degree that arthroplasty has failed to relieve the pain.

(6) Arthritis Associated with Non-union of Carpal Scaphoid and with Dead Proximal Pole.

This problem is somewhat comparable with Keinboch's Disease. We see many cases of non-union, or fibrous union, of scaphoids which apparently have been asymptomatic up to the time of sprain or strain. In the X-rays taken immediately following the accident the old fracture is noted and shows sclerosis with cystic degeneration. The adjacent joint space shows marked degrees of traumatic arthritis. It is of interest that the patient states that he has never been bothered with pain in his wrist before. It is partially because of this observation that we tend to reject the views expressed by Sir Reginald Watson-Jones. He advocates immediate surgical excision of the proximal pole as soon as a radiological diagnosis of devitalization is made, in order to guard against a painful arthritic joint. Our policy now, is that of prolonged immobilization in plaster. If

the proximal fragment dies and there is no evidence of union with revascularization, after twelve weeks of continued immobilization, then bone grafting with a peg across the fracture line and into the dead fragment is recommended. If the fragment is too small to accept a bone peg,then excision of the proximal fragment should be carried out. These results are as good as early excision from the standpoint of painful arthritis and the results of the many cases which revascularize are far superior.

(7) Rheumatoid Arthritis—

As expressed elsewhere in the literature, trauma does not play a role in the development of rheumatoid arthritis. It is agreed that trauma may aggravate a rheumatoid arthritis already present in the joint traumatized.

Rarely, a truly perplexing problem in assessing the role of trauma in rheumatoid arthritis is encountered. One case concerns a workman who had previously been well. He sustained a blow to his wrist and hand. X-rays were negative for fracture, dislocation and arthritic change. He went on to develop polyarthritis and became a clear cut case of the rheumatoid type. It was considered that the trauma must have acted as the precipitating insult in a case considered to be in a pre-rheumatoid arthritic phase.

Another case to be cited concerns a man with a prior history of rheumatoid arthritis. He received a blow to his knee. The knee became swollen and painful and an acute exacerbation of all his previously affected joints occurred. Here it was considered that the trauma caused a general reactivation of a smouldering rheumatoid arthritis.

A third case was a workman who sustained a blow to his ankle. It became swollen and painful. During his convalescence he underwent extraction of his teeth which were diseased. He developed acute pain and swelling in the injured ankle, and then polyarthritis. It was considered that the injury to his ankle predisposed this joint to the initial rheumatoid attack.

(8) Gouty Arthritis

Trauma does not cause gouty arthritis. However, trauma may aggravate and precipitate an attack of gouty arthritis.

A middle aged man sustained a blow to his foot and a fractured tip of the medial malleolus. He developed a swollen big toe and ankle joint. He did not respond to salicylates, but showed a rapid response to Colchicine. A diagnosis of gouty arthritis was made. He has had recurrent attacks which have continued to respond rapidly to Colchicine.

It has been the policy of the W.C.B. to accept responsibility for the treatment of the initial attack which follows trauma.

(9) Reiter's Syndrome

Recently two cases of Reiter's Syndrome were encountered.

The first case was that of a young man who sustained multiple bruises to his leg, a small haematoma to his thigh and a blow to his patella with early evidence of knee effusion. He convalesced satisfactorily from these injuries, but about the time he was ready to leave hospital he developed a polyarthritis, conjunctivitis, and very fleeting urethritis. A diagnosis of Reiter's Syndrome was made. It was felt that it must be considered coincidental to his injury.

The second case was a young man who sustained a severe sprain to his ankle. The joint became swollen and painful and he was unable to walk on it. Several days later he developed polyarthritis, conjunctivitis, and urethritis. A diagnosis of Reiter's Syndrome was made. It was concluded that the trauma to his ankle had acted as the precipitating factor and the Board accepted a limited responsibility in the treatment of his Reiter's Syndrome.

(10) Reflex Neurovascular Dystrophy

The Ontario Workmen's Compensation Board has a record of only one such case which has gone on to radiological arthritis change. This is the case of a young woman who sustained a minor blow to the dorsum of her hand. The hand was slightly swollen and painful, and there was a subcutaneous haematoma. The hand, wrist, and lower one-third of the forearm subsequently became cold, clammy, blue and swollen, and extreme pain was experienced. The arterial supply was normal. A diagnosis of reflex neurovascular dystrophy was made, snd stellate ganglion blocks were given. She obtained responses of short duration. The

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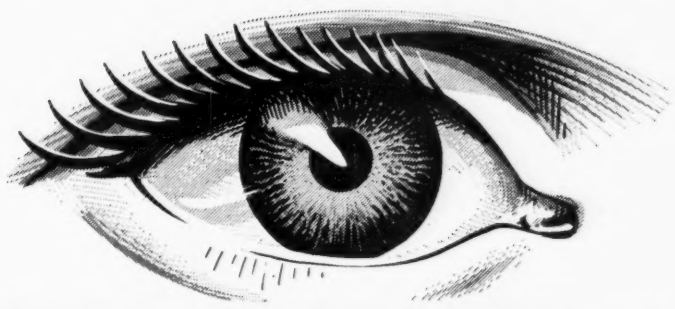
DIAGNOSIS and TREATMENT



# of EXTERNAL DISEASES of the EYE

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This discussion will be limited to the more common diseases and injuries of the eye which will come to the attention of the general practitioner or the industrial surgeon. Some of these conditions may be cured rather easily through simple treatment whereas others will require more specialized care.

One very important aspect of the question is the necessity for attention to minute detail in examination of the eye before making a diagnosis. Conditions which may occur in various parts of the eye will be dealt with in order.

The Eyelids

Dermatitis of the eyelids is a common complaint and is usually allergic in origin. Itchiness is a predominant symptom. Cosmetics are common offenders, and in this case the discontinuance or substitution of the cosmetic is the cure. Fumes and greases in industry sometimes produce a sensitivity reaction in the workman's eyelids. A common self-induced dermatitis may be caused by the repeated use of Boracic Acid. A good substitute for boracic is kitchen salt (1 dessertspoonful to 1 quart of hot water) which is cheaper, always available and never causes a skin allergy. Remember that any drug used repeatedly in the treatment of an eye condition can sooner or later cause an allergy—or so-called drug sensitivity. Common offenders are: Boracic Acid, Atropine, Sulfathiazole and Penicillin. Once sensitivity to a drug develops, the eye condition becomes progressively worse as long as the drug is continued. Most allergic reactions in the eyelids will subside in 10 days or so after the offending drug or substance is withdrawn. The symptoms and inflammation will abate more rapidly with the application of Cortisone Ophthalmic Ointment (1.5%) q.i.d. to the inflamed parts. Acute reactions may require the administration of systemic Cortisone.

Hordeolum or *Stye* is an acute inflammation of Zeis's Gland and therefore always arises in the hair follicle of an eyelash. Hot fomentations are the only necessary treatment in the early stages. If the inflammation progresses, a white spot of pus appears *connected to a hair follicle* which will rupture and drain itself if not incised. Many doctors diagnose any localized inflammation of the eyelid as a stye. If it does not have its focal point in a hair follicle, it is not a style and may be difficult to cure by ordinary methods. Recurrent styes may be treated successfully by massaging the lid margin with Aureomycin Ophthalmic ointment, or by a course of Staphylococcus Toxoid. Eyestrain is rarely the cause of recurrent styes.

A *Chalazion* produces a lump in the eyelid, usually about the size of a pea, and is the result of a low-grade inflammation in one of the Meibomian glands. When acutely inflamed they resemble styes but can be differentiated in that they are not connected with the hair follicle, as styes are. Most often they point on the under surface of the eyelid where they are seen as a raised whitish-yellow area. In the inflamed state they should be treated with hot fomentations. When the inflammation subsides a lump remains. Chalazions have to be incised (usually on the undersurface of the eyelid) and the lining cells thoroughly curetted out. It is unwise to attempt to cauterize the cyst cavity because some cauterizing agents have led to destruction of the eye and malpractice suits.

Laceration of the eyelid. The simple laceration, not involving all layers of the lid can be sutured in the usual manner. However, a full thickness laceration,

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no matter how small, involving the lid margin is a specialist's task to repair. The usual suturing of this type of laceration results in a notching of the eyelid margin. This constitutes a cosmetic blemish and may permit drying of the cornea and loss of the eye itself.

Rodent Ulcer or Basal Celled Carcinoma is locally malignant only. It is common in older patients and more often located on the eyelids, nose or check. It starts as a small scaling spot, and when the scale is removed a slightly weeping surface remains. As growth continues the lesion develops distinctly elevated smooth margins and a moist surface of characteristic appearance. In cases of doubt, a biopsy should be taken. The condition should be recognized early so that it can be removed without causing cosmetic blemish or requiring extensive plastic repair of the eyelid. Treatment consists of total local excision and/or radiation.

Xanthelasma is a common benign tumor, occurring most often in women past middle age. It appears as a yellow slightly elevated mass with a flat surface, usually near the inner canthus of the upper lid and often bilateral. It is regarded as a lipoid degeneration—and forms single or multiple deposits which may coalesce. The lesions may be removed by excision, application of CO_2 Snow, or diathermy. There is a tendency for xanthelasma to recur however, and to prevent this, low fat diet and thyroid extract may be indicated.

The Conjunctiva

Any inflammation of the conjunctival membrane is called *Conjunctivitis*. The condition is characterized by engorgement of the conjunctival vessels which are largest in the conjunctival fornices. Therefore, the redness of the eye is most intense in the fornices and it decreases as the margin of the cornea is approached. In severe conjunctivitis, the vessels all become greatly engorged and it becomes more difficult to identify the individual vessels. If the appearance of the vessels doesn't give a clue in the advanced cases, the symptoms will help you to arrive at the right diagnosis. There is at first a mucoid discharge which may become mucopurulent, or indeed purulent. In any case, the lashes become glued together with the discharge during sleep. The eyes burn and are very sensitive to light. Pain is not a symptom as it is in iritis. Also in iritis there is no sticky discharge—but instead, watering. Other signs of iritis are the loss of iris pattern, caused by oedema of the stroma, and the dilated anterior ciliary vessels produce the reverse engorgement to the one seen in conjunctivitis, i.e.—the most intense redness is seen at the corneal margin, and lessens toward the periphery. Conjunctivitis is treated with frequent hot saline fomentations followed by Aureomycin 1% in drop or ointment form. The ointment should be used at least at bed-time to prevent the lids being stuck together by the usual accumulated discharge that occurs during sleep. Dark glasses give added comfort and permit the discharge to drain during waking hours. A dressing should not be used.

Chemical Burns of the eye cause a high percentage of visual defects occurring in industrial accidents. Acid burns cause loss of sight by corneal scarring, but alkalies in addition are vicious in that they have the ability to penetrate all layers of the eye and fix themselves in the inner eye. Damage may be continuous for weeks after the original injury. All chemical burns should be treated by an eye specialist but first aid treatment is of paramount importance. This consists of immediate copious douching of the conjunctival sac with water. Don't waste time trying to get a neutralizing agent such as boracic acid for alkalies, or soda bicarbonate for acids. In plants where chemicals are a hazard, an inverted tap should be installed in a convenient location for such emergencies.

Sub-conjunctival hemorrhages are recognized by their sharply outlined appearance of bright red blood beneath the conjunctiva while the remainder of the eye shows no redness or other abnormalities. The condition is common, even after minor trauma—and its appearance usually frightens the patient. The hemorrhage usually spreads, increasing in size for a few days. Ice packs may control its spread but ordinarily no treatment is required. It takes 10–14 days for the blood to be absorbed.

Lacerations of the conjunctiva less than ¼ inch in length usually do not require suturing. An antibiotic ointment and an eye pad should suffice in minor lacerations.

Argyrosis is a deposition of silver salts in the elastic fibres beneath the conjunctival epithelium. Any silver salt (Argyrol, silver nitrate, neo-silvol) used repeatedly will produce a greyish-blue discoloration of the eye

particularly in the lower fornix and the stain is permanent. Argyrol should not be prescribed for any eye condition. The patient may use it too long and because the doctor has prescribed it he thinks it is the last word and will even recommend its use to others.

Pinguecula is a small yellowish spot on the conjunctiva, situated always in the palpebral fissure usually on the nasal side, and is extremely common. It is due to the deposition of yellow elastic tissue and hyaline. When the eye is reddened from any cause they stand out in relief and frequently alarm the patient. No treatment is ordinarily required. Occasionally however they are the precursor of a pterygium.

Pterygium is a triangular overgrowth of the bulbar conjunctiva which crosses the limbus in a pointed fashion and grows beneath the corneal epithelium. The ad-

vancing point or head may in time extend right across the pupil and permanently destroy useful vision. When the head has progressed 2–3 mm. into the cornea, the growth should be removed. Excision which includes the superficial layers of the corneal stroma is a meticulous piece of work and should only be done by a specialist. Some pterygia may recur after removal.

Dermoid cyst is a solid, fleshy, circumscribed mass with a smooth surface that straddles the limbus. It is congenital in origin, and is, in fact, a misplaced island of skin from the eyelid, often containing hair. Simple excision is the cure, which usually leaves a white scar on the cornea.

A Naevus may occur *of the conjunctiva* as elsewhere on the body. It is a flat pigmented spot which has no significance and requires no treatment, unless it increases in size—at which time malignancy must be suspected.

A Melanoma of the conjunctiva may thus have its origin in a simple naevus. Treatment, involving excision of the growth or enucleation of the eye, which is as a rule otherwise normal, is a problem for specialists —usually in consultation.

Melanoma of the Iris is a condition which the general practitioner may see much earlier than the eye specialist because there are no apparent symptoms of disease until it is well advanced. It appears usually at the periphery of the iris as a solid dark brown growth which is opaque to transillumination. These eyes have to be enucleated as a life-saving procedure. Metastases occur in the liver.

An Irido-Dialysis or severing of a portion of the iris from its root by trauma may resemble a melanoma on casual inspection. On more meticulous examination it will be seen that the pupillary margin is flattened on the side of the dialysis. The area of the dialysis which looks black with focal light (resembling melanoma) however transmits light when examined with the ophthalmoscope. It is in effect a second pupil and also transilluminates clearly. Usually no treatment is indicated for this injury.

Foreign bodies in the eye are the most frequent cause of injury of the eye occurring in industry. General practitioners often care for them and it is important to know the proper procedure when a workmen complains of feeling something in his eye. The examiner first looks at the surface of the cornea with a bright light and magnifying glass. If nothing is found, the lower conjunctival sac should be examined by pulling down the lower lid. If still no F.B. is found the patient is asked to look downward and the upper lid is everted over an applicator or match by lifting up on the eyelashes. It is here, held in the sulcus on the under surface of the upper eyelid that the foreign body is often found. It can readily be brushed off with a cotton applicator. If all these measures fail to locate the trouble, the eye should then be anaesthetized with 1–2 drops of Pontocaine ¼%. Instill a drop of 2% Fluorescin and then irrigate the stain out with water or saline. The fluorescin will help you find a small F.B. or abrasion by staining the denuded area green. If an imbedded F.B. is found it may be possible to brush it off the cornea with an applicator. Should this fail a corneal spud must then be used to dislodge the F.B. If it is not readily removed, it is wise to refer the case to a specialist. If no F.B. is found, but the Fluorescin points up an abrasion of the cornea which incidentally causes the same symptoms as a F.B., an antibiotic eye ointment should be applied and the eye padded firmly enough to prevent movement of the eyelid. The same treatment is used after the removal of an imbedded F.B. of the cornea, because here we are also dealing with a corneal abrasion. Immobilization of the eyelid with a firm pad will give the patient the greatest relief of any other single form of treatment. Most abrasions will heal in a matter of hours, if infection doesn't supervene. If the patient is not comfortable in 8–12 hours, he should be referred to a specialist. Infected abrasions cause permanent

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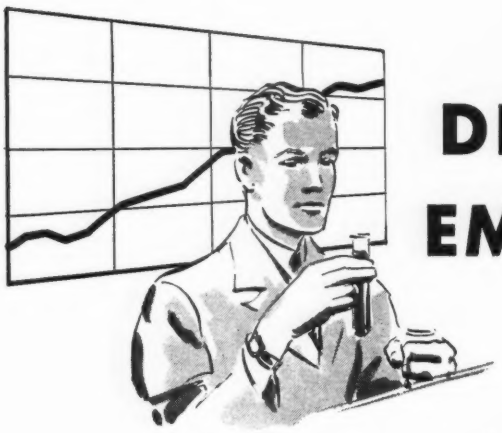

The DIABETIC EMPLOYEE

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The socio-economic importance of diabetes is implicit in the estimate that there are about 40,000 male and 11,000 female diabetic employed in Canada (1). It has been stated that the incidence of diabetes in American industry is less than 1% but recent population surveys have indicated that the actual incidence would be at least 2% in the wage-earning age groups but that only about half the cases have been diagnosed. That is, for each known diabetic there is one undiagnosed case in the general population.

Since diabetes is primarily a disease of middle and later years, it is seldom seen in young job-applicants but more often appears in the age group of the most experienced and valued workers, and of course, this does not exclude management and members of the board. The fear of losing employment in some firms may lead a diabetic worker to conceal the diagnosis, and by judicious use of insulin he might fool the plant doctor for a long time. It is evident that a policy of rigid exclusion of diabetics might backfire since diabetics fearful of revealing their condition could remain in jobs for which they are unsuited and possibly jeopardize their own safety and that of others.

What reasonable policies might be adopted by industry, generally in relation to the employment of diabetics? It is obvious that the policies of a generation ago are no longer applicable because the advent and proper use of insulin has greatly improved the life expectancy and efficiency of diabetics. As a group they are responsible, industrious persons who do not wish to be cared for or subsidized by social agencies. They do not request sanatoria or free medical care and they do not make public appeals for funds. They deserve the opportunity to obtain gainful employment in all but the few jobs for which they are medically unsuited. In some firms, archaic regulations arbitrarily exclude diabetics even at a time when other industries find it feasible to employ persons who are truly physically handicapped.

It is said that one of the aims in industrial management is to make a profit and it is evident that if this is to be accomplished in a competitive system the work output per employee in any firm cannot fall much below the average for that industry. What, then, has been the work record of diabetics in industries where they are being employed? Although comprehensive data on this point do not seem to be available there are two rather large surveys which might be cited.

One survey covered 31 Philadelphia industries with 150,000 employees. (2) Of these, one group of firms refused employment to diabetics for reasons which ranged from previous unfortunate experiences with one or more diabetic employees to quite invalid reasons indicating a total lack of understanding of the problems and potentialities of diabetic workers. Of the group of industries which did employ diabetics there were some without records good enough to permit analysis. In the remaining industries where well-controlled diabetics were employed in certain jobs and adequate records were maintained, it was found that the work record of the diabetic was better than average, with an absentee rate about two-thirds that for non-diabetic employees. Furthermore it was found that time lost by diabetics was seldom the result of the diabetes but was due to some unrelated condition.

Another survey of diabetics in industry was carried out by the U.S. Department of Labour in 1946-47 and the findings were a little less favourable to diabetics. In this survey, the work record of a diabetic employee

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was compared with the work records of two unimpaired workers in the same job. The absentee rate was 4.4 for diabetics compared with 3.1 for non-diabetics, the difference being largely due to prolonged absences on the part of a few diabetics. The non-disabling accident rate was 7.8 per 10,000 hours for diabetics and 7.4 per 10,000 hours for non-diabetics. The disabling accident rate was 15.6 per million exposure hours for diabetics and 12.9 per million exposure hours for non-diabetics. The less favourable statistics in this study may reflect the fact that all diabetics were included whereas in the Philadelphia survey the firms cited were employing controlled diabetics in selected jobs. As will be stressed later, this is the employment policy advocated by the American Diabetic Association. It excludes the irresponsible uncontrolled diabetics which not only protects diabetics in general against undue adverse publicity but also protects the group insurance plan against possible heavy claims. If further protection were deemed necessary it would be possible to place a limit on benefits available to the diabetic worker arising out of a complication of his condition.

The experience of the Metropolitan Life Insurance Company with diabetics in its employ has been that, "The work record of diabetics is satisfactory. They may carry on as well as non-diabetics and as a group do well enough to warrant their continued employment except in a few jobs". (3)

The Equitable Life Insurance Company has a group plan which covers diabetics as well as non-diabetics and their Medical Director, Dr. Harry Ungerleider, has been quoted to the effect that diabetics are as good a risk as non-diabetics. (2) Furthermore this company takes into employment known diabetics if they are under the regular care of a physician.

The American Diabetic Association has publicized its philosophy that 'diabetics are good employable risks'. In its statement of the Committee on Employment this organization has produced certain recommendations and suggestions which could be adopted generally as a basis for the employment of diabetics. (4) The Committee recognized that diabetic applicants should be classified according to the severity or quality of control of their condition.. Mild diabetics who require no insulin may be employed on the same basis as non-diabetics provided that they remain under the regular supervision of a physician. Probably the majority of diabetics do take a small does of insulin daily and are thereby well controlled. As a group these may be outstanding workers because in managing their condition expertly they have demonstrated that they are intelligent, disciplined individuals. There is another group of diabetics taking insulin who remain poorly controlled often because they are undisciplined and uncooperative. Their employment cannot be recommended, not only because of their inherent inefficiency, but because unfortunate experiences with a diabetic employee of this type can prejudice an employer against all diabetics.

The Committee on Employment of the American Diabetic Association has published a 'Summary of Suggested Standards for the Employment of Diabetics' which includes the following suggestions: (4)

1. The diabetic job applicant should obtain a note from his physician for presentation to the plant doctor stating whether or not the diabetes is well controlled.
2. While diabetics can perform any work for which they are physically, mentally and educationally equipped, exceptions should be made for types of jobs in which a hypoglycemic reaction due to insulin could result in harm to the diabetic or others.
3. Diabetics taking insulin should avoid changing shifts and in particular the 'graveyard shift' from midnight to eight in the morning because of difficulties inherent in a changing diet-insulin-activity schedule.
4. Possibly key plant personnel should be informed of the identity of diabetic workers taking insulin and advised of the nature of hypoglycemic reactions and their treatment.
5. Diabetic workers should be advised to carry identity cards indicating that they are diabetic, taking insulin and subject to reaction. Like other diabetics taking insulin they should have with them at all times a few lumps of sugar or candy which may be taken as needed to avert the development of a reaction.
6. If the plant physician can establish liasion with the family physician he can provide a valuable service in performing blood and urine tests at intervals to help procure and maintain good control of the diabetes.
7. The diabetic employee should have a thorough physicial examination at least once per year.
8. The plant physician should reassign a diabetic employee to another job if complications arise which create new risks to himself or the other employees.
9. With regard to standards of controls, the Committee stated that a diabetic employee may be regarded as adequately controlled if the fasting blood sugar is between 80 and 150 mg% and if a blood sugar taken 3 hours after a meal is below 250 mg%. An occasional blood sugar higher than this is not considered a bar to employment if the habitual level is satisfactory.

I shall not try to improve on these suggestions for the employment of diabetics but I would like to bring to attention a few of the medical aspects of diabetes which are important to the industrial physician.

Of primary concern in this regard is the accurate detection of diabetes. It is difficult to understand how the first morning specimen of urine ever deserved its

time-honoured place in diagnosis since as far as diabetes is concerned its only uniqueness lies in the fact that it is collected at a time of the day when glycosuria is least likely to occur. If urine testing alone is employed for diabetes detection the specimen should preferably be collected two or three hours after a meal. Even then it is possible to miss finding glycosuria in some mild diabetics and certain moderately severe diabetics especially in the older age group where the renal threshold is at times higher than 200 mg%.

Blood glucose determinations are much more efficient in diagnosis, as shown by a recent series of over 2,300 consecutive cases coming to a medical clinic, where routine blood sugars, done at random (2) increased the incidence of discovered diabetes from 2.4% (with glycosuria) to 4.0% (with hyperglycemia but no glycosuria). (5)

With regard to criteria for diagnosis of diabetes there is fairly general agreement that when a Folin-Wu method is used the following glucose levels in venous blood are significant or at least warrant thorough study of the glucose tolerance: 160mg. % or more 1-1½ hours after a meal; 150 mg% or more 2 hours after a meal and 130 mg% or more at any interval after eating which is greater than 2½ hours. This includes fasting tests. In fact, some regard with suspicion any post-prandial blood sugar which exceeds 140 mg%.

Since, in practice, only a single screening test is likely to be done, it is suggested that it be a blood sugar test taken about 2½ hours after a meal. As in the case of urine testing the post-prandial level is more valuable than the fasting level since a considerable proportion of mild diabetics will have a normal fasting blood sugar.

Early diagnosis of diabetes is important not only from the point of view of most effective employment of the diabetic but because prompt institution of normoglycemic control can ameliorate the diabetes and in some cases bring about its clinical disappearance. By normoglycemic control we imply that the blood sugar levels of the diabetic are made to behave like those of a non-diabetic through the proper use of diet and insulin; that is, levels below 160 mg% at all times and less than 130 mg% at any interval greater than 2½ hours post-prandial. This is not always easy or even possible to attain but the evidence indicates that it is the proper point of aim.

Formulation of a suitable diet and instruction of the patient in it is probably the most perplexing aspect of diabetic management for many physicians with the result that the diet program may be so inconsistent as to constitute a barrier to effective control of the diabetes.

Fairly recently the American Diabetic Association and the American Dietetic Association devised and published food value tables and lists of foods with equivalent food values (so-called 'Exchange Lists') which are being widely adopted as standard in hospitals throughout the continent. At the Ottawa Civic Hospital we have integrated these A.D.A. values with a list of 14 standard diets which range in size from 800 to 3600 calories and which are designated by number according to the number of hundreds of calories contained. Some of the smaller diets are designed for weight reduction and certain diets in the middle range cater to the tastes of juvenile patients particularly. This scheme is as simple as an adequate system can be and while conferring the benefits of standardization it remains flexible enough to meet the needs of at least 95% of diabetic patients. One of the benefits of standardization is that your patient can transcribe in terms of his own diet the recipes and other dietary information available to him in such excellent lay publications as the A.D.A. 'Forecast' and the very useful diet instruction booklet 'Meal Planning with Exchange Lists'.† From the doctor's point of view it is simply a matter of selecting from the list a diet which is judged to be adequate to permit that individual to maintain or attain ideal weight while performing his usual work. Adjustments to a smaller or larger diet may be required at times as indicated by undesirable trends in the body weight curve.

Time does not permit discussion of methods of stabilizing blood sugar levels in diabetes but, generally speaking, normoglycemic control is more often attained when it is actively sought. The limitations of fasting tests in diagnosis are equally true of their use as the sole indicators of the quality of control. Fasting tests are indeed useful, particularly in guiding the dose of long-acting insulin such as protamine, but are not more important than tests before lunch which indicate the requirements for rapid-acting insulin such as crystalline. Incidentally these two older forms of insulin still remain the most useful and there are only a few controllable diabetics who cannot be stabilized on some combination of these two insulins, given once a day. There are, of course, labile diabetics who will sustain an inordinate number of severe reactions if enough insulin is taken to avoid glycosuria. In these, one must settle for the limited objective of the best control which will still permit them to work without undue risk of reactions.

Good and sensible management makes the average diabetic a good employable risk. Given greater opportunities by industry, diabetics can make even greater contributions to our economy.

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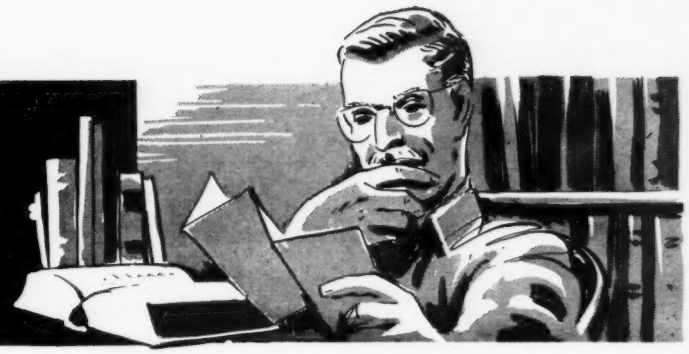
MEDICO - LEGAL PITFALLS



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Whether or not we realize it we should pause often, deliberately, to give thanks to our predecessors in the practice of medicine. We should remember that there was a time some hundreds of years ago when our profession, with notable individual exceptions, was looked down upon, distrusted and avoided even at the times when it could have offered some help. Our predecessors of the last two hundred years evolved a professional code of such high moral and ethical standards that it included and transcended the legal regulations which have always hedged the work of the medical profession. To this code the profession as a whole adhered so carefully and steadily and with such few individual exceptions that the high standards of conduct it demanded came to be taken for granted by everybody. There could not help but be a recognition that some men's ability was greater than others and made them better doctors but there seems to have been a confident assumption by patients that any doctor they consulted would do his best, in the fullest meaning of those words, for them.

Times have changed and the changes have been of a kind that alters the intimate, personal relationship between patient and doctor, not only changes it but lessens it, so patients tend to judge doctors a little less personally and a little more objectively. The assumption that every doctor does his best for every patient is not accepted now as widely and as invariably as it was: many a doctor who achieves only a fair or poor result despite his best efforts has to defend his actions in court. There are some few doctors, too, who unfortunately do not do their best for every patient and whose failure to do so is sufficiently apparent to produce dissatisfaction. So, if we are to reap the full benefit of our inherited reputation for honest, interested competence within our own individual limits, if we are to transmit this reputation to our successors, we should pause periodically to call to mind, not only our legal privileges but our legal obligations, to be sure we are fulfilling them in generous fashion.

Many doctors do not realize how closely they are hedged legally. A moment's thought though will remind us that, before we study medicine at all, we must notify the proper legal authority that we intend to do so. Later we must report to the same authority that we have completed the course, then must stand its examination to demonstrate our fitness to practice. If we complete the examination successfully, we acquire certain privileges; for example we are assured the right to practice, we can collect fees for the work we do and are empowered to enforce collection by legal means when necessary. These samples will serve as reminders of the many privileges we gain by admission to the licensed profession; others will not be mentioned here because we are more concerned today with the obligations we assume.

These obligations are just as concrete and failure to fulfil them can result in legal action against the practitioner who fails or, perhaps more important, who appears to have failed. Such legal actions may be brought by many agencies and persons. Governments and health bodies may take action to penalize doctors who do not fulfil their statutory legal duties. Patients who think they have been wronged may demand redress in court and if a wrong be demonstrated the courts will impose a penalty. More important on the whole, because it is true in a greater number of cases, is the fact that, to bring an action against a doctor, a patient need not have been wronged; he need only think he has been. This needs to be stressed. One of the remarks commonly made to those of us doing Canadian Medical Protective Association work is something like this: There cannot be many actions against doctors because after all a patient cannot sue unless the doctor has done something wrong. Actually, having done wrong is not the criterion at all. The deciding factor is simply that some patient thinks a doctor has done wrong. The suit he institutes is, in effect, a statement to a court that he thinks he has been wronged in some way

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by the doctor, and a request that the court award him some damages for the wrong. Whether or not the charge is true the doctor must defend himself; he must, in effect, say that such and so were the circumstances, that with sufficient knowledge and due care he did so and so, and the result, whether good or bad, was the best obtainable.

Let us, then, begin by considering some of the requirements and duties doctors must fulfil if they are to avoid the medico-legal pitfalls of practice.

The first requirement is that the doctor should possess sufficient knowledge. Though this at first thought would appear obvious it will bear a little closer examination. It may be assumed that any doctor recently licensed possesses sufficient general knowledge. This is sufficient, though, only if the doctor plans to do a general practice and, almost as important, if by his words and actions he makes it clear to his patients that he claims no more than a general practitioner's knowledge. If then a patient thinks him guilty of negligence or malpractice the standard of comparison for the work which gave rise to the complaint will be, not that of a highly specialized man in that field but the amount of knowledge and quality of work of other doctors doing general practice.

If a man is to be a specialist, it therefore would seem essential that, even at the expense of failing to possess as well-rounded a knowledge as the general practitioner, he should acquire more minute knowledge of his own speciality because, if he gets into trouble, the standard used to judge him will be that of other men similarly specialized and making the same claims.

So it will be apparent that mere possession of medical knowledge is insufficient; the doctor must know as much as the average physician doing the same kind of work that he himself claims to be able to do.

Possessing an adequate amount of knowledge in terms of one's colleagues carries another implication with it. It is not sufficient that a doctor once had adequate knowledge for the duties he claimed he was able to perform. Medical knowledge changes and new knowledge is acquired. The doctor's knowledge must be augmented and kept up to date. To use an absurdity as an example, a doctor today who because of ignorance failed to use an antibiotic that would have been specific, could not hope to claim sufficient knowledge if he were sued, even though he may have been the best doctor of some previous day.

You will have noticed, too, the implication that a doctor, legally speaking and in the eyes of the public, occupies the position in the profession to which he lays claim. He cannot claim to his patients that he is a specialist and hope to defend himself as a general practitioner or vice versa, he cannot do general work for which he is unfitted and hope to defend himself on the ground that it was outside a specialty he claims. To a degree that many of them do not realize, doctors write their own tickets and themselves lay the bases on which they will be judged if legal action is brought against them.

Once in contact with a patient the first duty of the physician is to get permission for the treatment he considers necessary, including diagnosis and therapy. This may be granted in many ways. Most commonly it is implied by the mere fact that the patient reported of his own free will to the doctor, stated his complaints and asked that something be done for them. In many cases however when a diagnosis has been made the doctor should state what he thinks to be the matter, outline in general what he proposes to do and ask again for permission to proceed. More will be said later about this need for permission so, now, it can be dropped with the reminder that for many forms of treatment this subsequent permission needs to be in writing, dated, signed and witnessed.

The permission, moreover, serves another purpose. Every time a doctor undertakes investigation or treatment of a patient, the two, doctor and patient, enter into a contract. In effect, permission is the patient's part of the contract made between him and the doctor. It is the patient's means of saying he will place himself in the doctor's care and will co-operate with the doctor in the treatment to the best of his ability.

The patient having offered a contract, we need to think of the physician's part of it. Perhaps we should start by defining a contract. In Gordon, Turner and Price's Medical Jurisprudence, 1953, a contract is defined as "an agreement between two or more persons which creates or is intended to create a legal obligation." Once he has received the patient's permission and accepted responsibility, the practitioner's legal obligation is to treat the condition in the light of his own knowledge, according to his best judgment, using reasonable skill and care in the application of his knowledge. Such a contract endures until the termination of the illness, with two exceptions, namely, when a doctor is discharged by the patient or when mutually satisfactory arrangements have been reached for someone else to complete the contract, that is, to proceed with treatment until the termination of the illness.

Now, for simplicity's sake let us work backwards over some of the things we have mentioned. The first is the termination of the contract by transferring the care of the patient to another doctor. Theoretically the patient voids the contract if he fails to co-operate but if an action were brought against the doctor on the ground that he foresook his case, such a defence would be hard to establish so the physician should do his utmost to get the necessary co-operation. Practically speaking, the doctor can break his contract only by transferring the patient to another practitioner. It is worth noting here that the only doctor in a large dis-

trict may never be able to break a contract because there may be no one else available who can fulfil it. Where one or more other doctors are available, though, the transfer may be made if the practitioner has made it clearly evident to the patient that he wants to stop treatment and that another doctor will consent to undertake the patient's care. This notification that he wishes to stop treating the patient should be accompanied by an offer to assist the new man with all the information that has been gained to date.

There need be no comment about the termination of the contract that occurs at the end of an illness. The contract has been fulfilled and is no longer in force. At first glance it would seem equally obvious that being discharged by the patient would terminate a contract just as definitely. There may, however, be the necessity for the doctor to warn the patient of the need for further treatment and even if such necessity does not exist it may be very wise for the doctor to protect himself by giving whatever advice he thinks applicable.

Earlier it was indicated that there would be more discussion of permission and the need for it. It is quite possible, and not uncommon, for patients to come with a specific request that a doctor treat them. However, permission is much more often implied. Patients present themselves, state symptoms and, without ever making a request, simply expect the doctor to proceed. The permission is still further implied when, as time goes on, patients do not object but rather accept instructions and follow them. There are many instances where such implied permission or, more important, a verbal request for treatment, is insufficient.

Generally speaking, permission should be written, signed, witnessed and dated for all surgical procedures, and for many diagnostic medical and surgical procedures which carry with them some danger. The request for such permission should be preceded by an explanation of the proposed treatment, what it involves, what results may be expected from it and, what complications might ensue, if any may reasonably be expected. The permission form should be arranged to show that explanation preceded permission. The procedure of obtaining permission should not be done in a perfunctory, routine manner with the result that the patient may not realize what he has signed. Too often the permission form is just one of many which a patient, for example while being admitted to hospital, is asked to sign, with no special emphasis being placed on it. If trouble arises later about permission or lack of it, many courts give sympathetic hearing to a patient's claim that he had no idea that one of the forms was permission for treatment or operation. Signing the permission form should, somehow, be done separately; the statement should be clearly made by the nurse or the doctor that this form gives permission for the treatment decided upon for the condition which was previously discussed with the doctor. Then no patient can say he did not realize what he was signing.

The doctor's explanation should be as explicit as possible and should avoid the two extremes of too little and too much talk. It should be full enough for the patient to have a satisfactory knowledge of what is proposed, what results are expected, and what complications could occur if they may be a matter of importance. Remember that no doctor is omniscient and where a thing will end cannot always be foretold when it is begun; many a doctor has had to do a bowel resection when he thought he was starting a simple appendectomy. Therefore, it is important that you give a thorough explanation, in language familiar to the patient, so that he understands what is involved. Make it fair—to the patient and to the doctor in case he has to change the contemplated procedure. Avoid the other extreme. Do not stress the seriousness of the procedure, its dangers and its possible complications, so strongly that the patient is frightened unnecessarily or prevented by fear from accepting some treatment that will contribute to his well-being. It has been established in court that if a doctor owes a patient a fair explanation, he owes him no less an explanation that will not prevent him accepting necessary treatment.

If the same procedure must be repeated after a lapse of time, written permission should be obtained again. Only recently the Association was asked for advice because of trouble which arose during a second series of shock treatments for which no permission had been obtained because the doctor thought permission for the first series some time previously would be enough.

Aside from his contract to treat a patient to the best of his ability, a doctor has a duty to maintain his patient's confidence, not to discuss with anyone else anything of a confidential nature which he has learned

in the course of his medical work. Professional confidence, as such, is an ethical concept, and, in spite of the fact that it may have no standing in law, should be maintained both from the point of view of patients and of the profession. It is wise to adopt the attitude that a patient's business will be discussed with no one other than the patient, as a general rule not even with members of a patient's family unless it is clearly understood that this is desired by the patient. More than one doctor has found himself in difficulty because he gave information to a husband or a wife or a parent when it was the patient's wish that such information be withheld. Act on the assumption that nothing will be said to any third person about any patient unless permission has been given. While remembering that implied permission is a good defence, be sure that the actions thought to have implied permission did in fact mean what you interpreted them to mean. Permission, for example, may be implied when a husband or wife brings the other partner into the doctor's consulting room.

Two or three situations can cause difficulty. One is the adult child who is sent by a parent. Permission to report to the parents should not be assumed; something should be said to the patient to give him an opportunity to say whether or not he wishes the parents to know. The fact that a third person is paying the fee for examination or for treatment does not give the doctor the right to transmit information about the patient to the third party. Get permission before transmitting any information. If permission be not obtained, either because no request was made for it or because it was refused, refer the inquirer to the patient, with the explanation that all information was given to the patient from whom it may be obtained.

A difficult situation arises for doctors acting as examiners for employers, examiners whose findings may determine the employability of prospective employees or the continued employability of present employees. The ideal situation would be to have an arrangement with the employer whereby only the conclusions reached as a result of the examination would be given, for example, either that the patient is healthy and physically suitable for the proposed employment or that he is unsuitable for reasons of health or physical status. This ideal, unfortunately, seldom is reached. In the vast majority of cases the employer wishes the actual history and physical findings on which the doctor bases his conclusion. When this is so there are the two courses that may be followed: Every examination form should have a permission form included and the patient should be asked to sign it and should be told that it allows the doctor to transmit the findings and conclusions to the employer. If that be not possible the report containing the findings may be handed to the employee with a clear statement that it contains all the findings and the suggestion that it be given by the employee to the employer. If, knowing what it contains, the employee gives the form to the employer, no other permission is necessary. While it is true that refusal to pass along the information may mean the loss of a job it is equally true that the doctor exerts no compulsion on the individual who is at liberty to withhold the findings and, presumably, lose his job.

When we come to the actual work done by doctors the commonest single cause of complaints and claims against them can be stated in one word—carelessness. It is so easy for a doctor, who is so often faced with a number of competing calls for his attention, to hurry, to be careless and to have ill results follow and then to excuse himself for something that he would condemn in a fellow practitioner.

The carelessness may take many different forms. Sometimes it is not obvious until the trouble has arisen. Leaving drains, sponges and foreign bodies in wounds obviously is the result of carelessness. There are rare cases where the carelessness may have some explanation, such as a nurse reporting a correct sponge count when in fact it was wrong, or the usual search for foreign bodies being shortened or prevented by the precarious conditions of the patient. But there are many more cases where none of these things are operative. The doctor was literally and simply careless. The doctor who fails to use anti-tetanic serum where it should be used and who loses a patient with lock-jaw, cannot hope to defend himself. He knew better. If circumstances, such as a lack of anti-serum at the moment or the need to attend to other casualties, forced him to defer the administration, he could give it at some time in the immediate future. There is just no excuse for the omission.

The doctor who inadvertently ties off the artery instead of the vein when he attempts a venous ligation is hard put to defend himself. Almost invariably the leg is lost and no excuse can absolve the doctor of responsibility. He cannot have known his anatomy and he was incompetent for the surgery he attempted. There are many examples of surgical incompetence and surgeons seem to get penalized more often than physicians because their mistakes are more obvious. This underlines the fact that unless surgeons are competent to deal with any emergency they may meet in the course of the proposed surgery, they should not undertake it.

Physicians are not immune either. Not long ago a patient made a claim against a doctor who did not examine the urine at the time the patient presented himself for treatment of a sore foot and leg. Later it was found the patient was diabetic and it was reasonable to suppose the trouble in the foot and leg was the result of the diabetes and earlier treatment might have been helpful.

There are some forms of carelessness for which there may be not a reason but an excuse. A patient

may object strenuously to the trouble or the cost of an X-ray, for example. Nowadays it is rare for a doctor to omit an X-ray in the treatment of fractures because all are aware of the need for accurate diagnosis if the reduction is to be satisfactory. Most doctors, too, are aware that they need a check X-ray to demonstrate the success of the reduction. But there are occasional cases where a patient's objections have just enough validity to influence the doctor. As long as the result is good, of course, no objection is made by the patient. But let the result be poor and things are different. The patient then claims the results to have been poor because the doctor failed to have the X-ray, and says the doctor, with his knowledge, should have known it was necessary and should have refused the patient's request.

Just recently a case of this kind had to be defended by the Association. A doctor was consulted by a patient who obviously had a fracture. The doctor requested an X-ray stating that it was necessary, but finally acceded to the patient's request that the fracture be reduced without X-ray because of its cost and because the patient would have had to go twenty miles to get it done. The result of the reduction was poor, tragic almost, and the patient promptly forgot the fact that the doctor had wanted the X-ray and resigned himself to do without it only at the patient's insistent request. Suit was brought partly on the ground that, had the doctor insisted on the X-ray, he could have prevented the bad result.

It is possible to formulate a general principle, an important general principle about such cases as this. Do not risk doing poor work just to save money for a patient. Doctors are not thanked if results happen to be good under these circumstances but they certainly are blamed if results are poor, ironically enough on the ground that the doctor should have known he might not be able to do good work without the necessary investigation.

One last point and some conclusions to be drawn from it are worth mentioning. It is a harsh fact but a fact nevertheless that almost no claim against a doctor arises unless the doctor has contributed to it. He may not have done anything wrong or left undone anything very important but he did contribute in some way. He may only have been hurried and have allowed his hurry to be evident so that it was remembered by a patient whose result was not as good as the patient expected. The doctor may not have taken the time to give the patient a reasonable explanation of the illness, or what he proposed to do or, more important, why he thought it wise not to do anything at the moment. A doctor owes his patient some discussion of an illness. It need not be a dissertation on the illness but it should be a fair explanation and it should be suited to the mentality of the patient so he will not feel he is the victim of double talk.

It is inevitable that there will be cases where dissatisfaction is expressed about the outcome of treatment. Many patients do no more than hint, others are brusque enough or angry enough to start threatening when they first express their dissatisfaction. The doctor's reaction to such a complaint often lays the foundation for a legal claim which would not have followed if the complaint had been dealt with dispassionately. Strangely enough, doctors tend to react to this sort of thing in one of two ways and both ways are wrong. Either they feel that they completely mishandled the problem so that they cannot defend themselves and their remarks are so apologetic that the patient feels his complaint must be well founded. It is wise to remember that a diagnosis which at the end of an illness, is obvious, may have been completely obscure at the beginning in spite of the best efforts of the doctor. No apology is necessary under those circumstances though a short explanation may be wise. The other extreme is the doctor who becomes as angered as his patient and says things that stimulate a suit.

Not long ago the Association had to defend a doctor in court. He had done some minor surgery on a patient, the immediate post-operative course was uneventful but the wound failed to heal. A few days after the patient was sent home the parents called to report that they had removed a small sponge from the wound. With no attempt at explanation, not even a regret or a statement that no harm had been done aside from the delayed healing, the doctor flew into a rage, blamed the nurses at the hospital, said they would have to be held responsible if any ill results occurred and generally conducted himself so that the parents felt that he was trying to conceal a fault of his own. The case went to court, no damage could be proved, and the action against the doctor was dismissed. In his comments, though, the judge said that but for the maladroit handling of the complaint when the error was discovered there would have been no action against the doctor. To paraphrase David Harum, patients have about as much human nature as doctors and if circumstances were reversed doctors would appreciate a reasonable explanation.

The Diabetic Employee

(continued from page 20)

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EARLY TREATMENT OF INJURIES

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This topic is much too large to be dealt with exhaustively in the short space of one article so this paper will be confined to the omissions which occur frequently in early treatment of injuries, and examination of a few areas in which miscalculation or misjudgements are commonly made.

Diagnosis:

A complete and accurate diagnosis is, of course, the prime and major essential for intelligent treatment. Yet how often do we focus our attention exclusively on the single dramatic presenting lesion and fail to search for related or unrelated injuries. In the case of a patient with a traumatic dislocation of the hip, it is not enough to establish the diagnosis of his injury plus the integrity of the sciatic nerve—the same force that dislocates the hip can severely traumatize the knee. It is well recognized and frequently emphasized that the patient with a fractured os calcis should be examined for a fracture of the lumbar spine, yet how often are we warned that the fall on the hand which fractured the clavicle may also have fractured the navicular—and how often do we deliberately search for such a second injury?

The first point to consider in the early treatment of injuries is that a thorough search must be made for other injuries. This is particularly necessary in car accidents where no precise estimate of the damaging forces can be made. For a brief instant the victim is like the pea in a whistle—so the potentialities for damage are limitless. The patient may have a dramatic femoral fracture yet this lesion can safely be left alone for the brief period required to decide whether his ankles are tender, whether his back hurts and whether his wrists move fully and painlessly. The patient with a traumatic crisis requires a full clinical skeletal assessment.

The second point in the treatment of an acute injury is the First Aid approach. In the case of fractures the phrase "splint 'em where they lie" has been ignored as long as it has been preached. One still sees patients in the emergency room with a distorted forearm lashed to a flat board. The portals of the fracture room still open to the patient who has spent the previous hour or so touring the hospital, on and off a stretcher, buffeted in X-ray and bled in the ward, undressed and dressed, premedicated and prepared, all with a deformed leg lying on a pillow. Once a fracture of a limb is recognized it should be splinted as it is, to prevent further damage. There is available on the market now a revolutionary and novel universal splintage material known as plaster of paris. This material is sold in boxes of slabs of various width—5 to 8 thicknesses will control any peripheral fracture, it will not foil the ardent interne, baffle the most officious nurses, nor trouble a competent radiographer. There is no logical reason why plaster of paris should be reserved for the retention of anatomical reductions produced in a hospital. Placed over the clothes if necessary, it will provide the most accurate and comfortable splintage, and will permit relatively thorough investigation of the patient without increasing the pain or the deformity. Provided one sticks to slabs held on by elastic bandage, a single box of plaster slabs is worth all the prefabricated splints in existence.

The next problem in managing acute trauma is the assignment of priorities. The first group of people from whom the patient must be protected is the radiographers. These young ladies are not clinicians but rather esoteric radio-chemists to whom X-raying a limb means producing precise and accurate AP and lateral views of a given area. In elective orthopaedics and fracture work this is a commendable ideal but it has no place in acute fracture work. A scout film is the first requirement—a single film taken at any angle through the suspected zone. Once this is viewed we can decide whether we need more information or not and order and cancel films as is necessary. A single, poorly executed film may give us all the information required to permit intelligent treatment. If the scout film reveals an oblique fracture of the tibia obviously requiring internal fixation there is no need to subject the acutely injured patient to further insult on the X-ray table. Any detailed preoperative X-ray studies can take place after the patient is anaesthetized and before the incision is made.

Fig. 1 is an example of the scout film. This X-ray is so bad technically that they didn't even put on the hospital marker. Vaguely through the haze there can be identified an intact femoral neck and hip joint and a fracture of the pelvis. Accordingly, we were able to treat the man for his physical abnormalities of a short, externally rotated leg and a haematoma over the right buttock without aggravating his general condition. This man at the time the film was made was virtually

moribund—he had been struck by a hit and run driver late at night and lay all night in subzero weather in a snow drift by the roadside. Accordingly, by the time he was admitted the natural wishes of the radiographer to produce neatly centered, biplane films had to receive rock bottom priority. The teaching that all fractures must be X-rayed from at least two angles is not strictly true in emergency fracture work. When the general condition of the patient is poor the fracture may have to be virtually neglected. Fig. 2 is the sole picture of a serious bone injury that was taken during the patient's

Fig. 1

first 8 days in hospital. We can decide from this single film that there is a fracture in the supracondylar area of the femur, we can see shortening so there must be overriding and therefore loss of apposition and that in all probability the distal fragment has followed the usual course and is tilted backwards. Given this film it took 15 minutes under Demerol sedation to apply a Thomas splint with Pierson attachment and to immobilize the limb with the fracture unreduced—but not untreated.

This particular woman was in her 70's, grossly overweight and by the time she reached hospital she was in fulminating and presumably irreversible cardiac decompensation. The fracture received a low priority; yet it had to be controlled because of its deleterious effect upon an already overburdened heart. It is obvious

Fig. 2

that potentially fatal disorders of other viscera and systems demand priority over mere malalignment of bone. However, it must never be overlooked that the pain and general debilitating effect of a fracture may have a serious influence on a decompensated heart or a disordered metabolism. This has specific reference to fractures of the femoral neck which most often occur in the elderly —a group subject to general systemic disorders. One cannot hope to control an elderly diabetic or cardiac patient in the face of an uncontrolled, major, debilitating fracture. The problem here is not whether the patient can stand an operation but whether they can stand not to be operated upon. It is the practise in fractures of the femoral neck to treat them as urgent—not emergency—surgical problems. Get the advice of a competent internist as to the patient's specific general deficiencies and allow 8 to 12 hours to get those deficiencies corrected. If good medical treatment cannot control a disordered glucose metabolism or an incipient bronchopneumonia in 8 hours then it will never control them in the face of an untreated fracture of the femoral neck. Over a period of time and in a large number of cases a Smith-Petersen nail will rescue more patients than any form of purely medical therapy.

Another point to be considered about X-rays and X-ray interpretation in the early phases is the frequency of false negatives. It is well known and generally accepted that a fracture of significant severity can exist in the carpal scaphoid with perfectly normal X-rays—only after 2 to 3 weeks does the precise nature of the wrist injury become clear. What is not nearly so well recognized is that this phenomenon of delayed radiological evidence of a fracture occurs in any bone or portion of a bone where there is a large element of cancellous bone. For example, a man was flung from a fire engine and sustained multiple injuries. His complaints of back pain were minimized as X-rays of the spine showed no fractures. (Fig. 3) However, he responded slowly to conservative therapy and after 3 weeks, further X-rays revealed crush fractures of no less than 3 vertebrae. Fig. 4 is the X-ray of a neck taken 3 weeks after injury. The patient, a doctor, sustained severe head injuries in a car accident. Upon initial examination his complaint of neck pain was supported by tenderness over the lower cervical spine. X-rays taken the night of admission, including forced flexion films, were normal—even with detailed inspection in retrospect. In actual fact his failure to clear up with conservative measures lead to re X-ray in the third week at which point a serious fracture subluxation was identified. There are many other situations where X-ray may fail to identify a significant fracture—the talus, the tibial plateaus, the vertebral column, the carpal scaphoid. If a fracture in these areas is suspected on clinical grounds, the patient must not be allowed to drift away until delayed re X-ray has ruled out a hidden fracture.

Priorities According to Systems and Tissues

Within a given limb severe soft tissue injuries may present a major problem in assessment. What features of a multiple injury demand immediate attention, what injuries receive deferred treatment and what injuries must be dealt with at once?

Obviously the first consideration must be given to injuries compromising the life of the patient or the limb. Obvious external haemorrhage notoriously re-

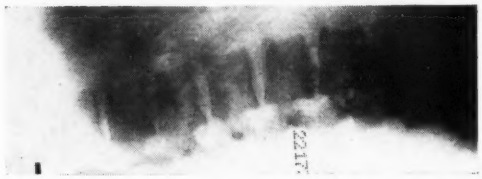

Fig. 3

ceives absolute priority even from the untrained layman. Equally serious, although much less dramatic in its manifestations and far more subtle and evasive in its progress is interruption of the vascular supply. Widespread ar-

Fig. 4

terial spasm produces its first prominent symptom as a sort of swan song for the limb. Accordingly, spasm must be suspected and searched for and if suspected dealt with immediately, thoroughly and drastically. In this regard, it has not been sufficiently firmly emphasized that an intact peripheral pulse does not necessarily rule out vascular spasm. Following a supracondylar fracture of the humerus in a child, the radial pulse can persist while the muscles are perishing from ischaemia—a good radial pulse does not eliminate the possibility of Volkmann's contracture. If the muscles can be demonstrated as contracting strongly and painlessly then the blood supply must be adequate—only with good muscular function is the vascular integrity to be presumed intact. Early signs of ischaemia such as poor muscle contractions or excessive pain are the important indications.

Another form of haemorrhage which is of as great importance as external haemorrhage is internal haemorrhage. The foot (Fig. 5) was injured in a car accident. The metatarsal fractures are obvious and on closer examination a tearing of the foot can be seen. The lateral portion of the foot has been torn into valgus. What cannot be seen but what is of far more moment than the bony injury is the vascular injury. The arterial arcades of the forefoot linking the plantar and dorsalis pedis mother vessels must be torn. In actual fact, this particular injury is known as Lisfranc's fracture and it carries with it a 30% mortality for the involved foot. In other words, although rare this injury is extremely dangerous. Where the foot is torn apart, progressive haemorrhage is as liable to kill the foot as progressive intracranial haemorrhage is to kill the patient. The bony injury here is insignificant compared to the vascular injury.

Once the vascular problems are met the next consideration should go to the control of infection. For this enviable project nothing is as efficacious as an intact epidermis. Except with gross devitalizing muscular injuries such as obtain in war wounds, surgical toilette of the wound should be followed by provision of skin coverage by primary closure, Thiersch's grafts or advancement flaps with grafting of the surgical defects. Muscular wounds may be packed open but a raw tendon or ligament or a bare bone must be covered. Vaseline

Fig. 5

gauze or blood clot will not nourish a denuded tendon—to pack such a wound open is to kill the heavier caliber connective tissues.

These two systems then require early and thorough investigation and have a high priority in treatment. On the other hand, tendon, nerve and bone deserve no priority at all. You must have a dry wound, a clean wound and a closed wound. Given these conditions tendon repair is never an emergency, nerve injuries can be allowed to wait and bone can be left for later definitive treatment. Of course, if such injuries are identified and are readily amendable to repair or control, then they should be dealt with. However, any extensive dissection from suspect wound into clean, uninvolved areas and planes is indefensible. For example, a severed digital nerve can always be identified, freed, mobilized and repaired at any time—there is no possible excuse for tearing a traumatized finger apart to identify the severed nerve ends.

So much for the general principles involved. Now one or two specific injuries—lesions in which the early treatment may have a considerable bearing on the final outcome—will be discussed.

Fig. 6 shows the commonest fracture in the body. It is so common that it has lost its true significance. Everybody treats Colles' fracture. What has been long missing is a critical analysis of the results. Over the past few years there have been one or two reports of large series and very disquieting reports they have been. For example, in a series of several thousand Colles' fractures

the New York Compensation Board reported an average loss of hand function of 24% and restoration of an anatomical and functionally normal wrist in exactly 3%. There has been no explanation for these apalling figures and no suggestion as to how they can be improved. The only feature which shows any consistent correlation is the accuracy of initial reduction. By and large the better the initial reduction the better the final result—a state of affairs which, to some extent, must be inherent in the fracture itself as the milder the injury, the easier will be the reduction.

One important element in obtaining a good reduction is firm, prolonged traction. In severely deformed Colles' fractures or markedly comminuted fractures where we want to minimize manipulation in order to avoid further disruption of the joint surface, this method has proved very successful. The essential features are that longitudinal traction is applied to the fracture through the thumb using forces of the order of 10 pounds for 10 minutes (Fig. 7). This will safely disimpact the fracture, will in fact distract it and will not disrupt comminuted fragments. After the traction has been applied the final manoeuvre is to swing the hand into pronation (or if you prefer into volar flexion and ulnar deviation) thereby reducing the fracture by reversing the original force. Once reduced the fracture must be immobilized.

Fig. 8 shows the basic slab which is applied without padding to the forearm and wrist. It is held in place by a crepe bandage to allow for the inevitable swelling. Over the first 2 weeks the bandage is changed as frequently as necessary to accommodate the changing size of the wrist—the plaster itself is left untouched. After 2 weeks the hand should be brought into the classical Colles' position (Fig. 9) as prolonged volar flexion will lead to wrist stiffness. The point, however, that requires re-emphasis is that the encircling bandage must be expansible—a firm skin tight plaster around a fresh fracture will sooner or later lead to disaster.

Fig. 10 shows the result in the X-ray mentioned above—the reduction is good, the joint surface has not been further insulted and the hand is in the correct position with the second metacarpal in line with the radius in the AP view.

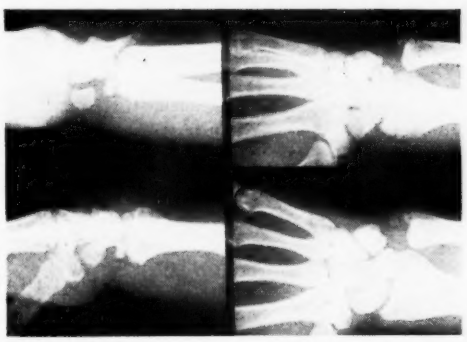

Fig. 6

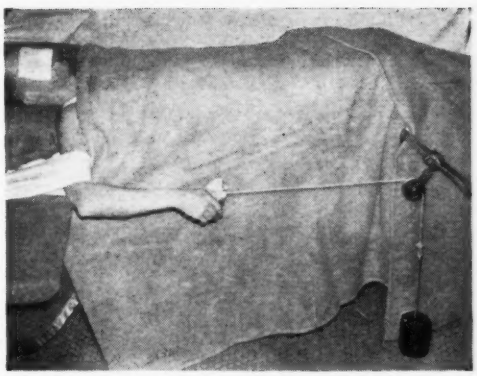

Fig. 7

In the after care of Colles' fracture, it is vital that the hand be used actively. A swollen finger cannot bend any more than an over-inflated inner tube can be buckled. The only way to reduce finger swelling is to milk the oedema fluid out by active finger contractions. The hand must be used and we must see that it is used employing any method of coercion short of physical assault. If the patient will not use the hand with a plaster on, you might just as well take the plaster off, either way the hand or wrist are ruined.

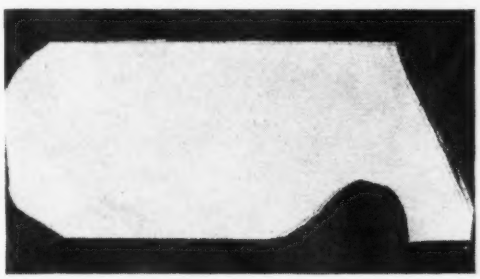

Fig. 8

Fig. 9

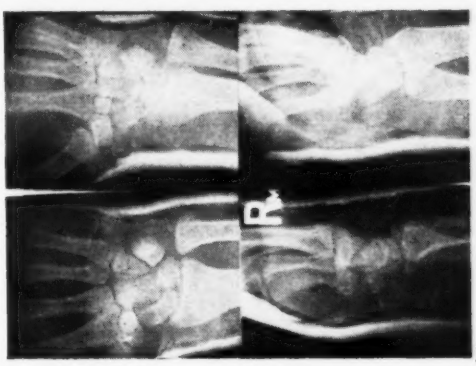

Fig. 10

Fig. 11

There is a basic dictum in fractures that there are 4 steps in handling such an injury—diagnosis, reduction, immobilization and rehabilitation. Like any dictum this one has its exception and it is to this exception that attention will now be drawn. Fractures about the shoulder usually do not require immobilization. The

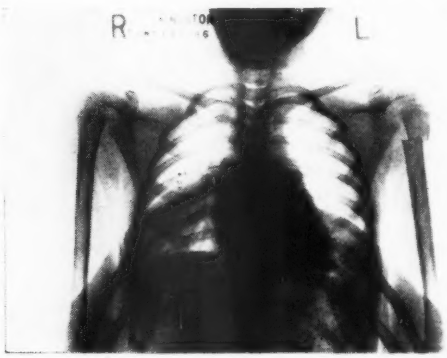

Fig. 12

problem in most shoulder fractures is not nonunion (which does not exist) nor of malunion (which is rarely of significance) but of permanently stiff shoulder. Accordingly, there is little purpose in treating problems which are negligible by a method certain to increase the complications. Fig. 11 is a child with a most unusual injury. These fractures were reduced by manipulation, the wrists were crossed under the chin and held by a collar. Next morning the child was made to get up and allowed to roam around the ward. In 3 weeks she was out of the slings and in 6 weeks had a normal painless range. (Fig. 12.)

Fig. 13

Fig. 14

Oh well, you say, an easily reduced fracture in a child—any treatment would produce a good result. A stenographer, had an irreducible fracture which required an open reduction. (Fig. 13) Apposition was held by 2 wire sutures although the fracture was still somewhat mobile. This girl was held in a collar and

Fig. 15

Fig. 16

Fig. 17

cuff immobilization which was removed frequently for *active* movements on the first post-operative day. In 10 days she was home with a fairly comfortable shoulder and by 8 weeks she had a functionally intact shoulder although precise assessment showed some loss of range. (Fig. 14). At 8 weeks if we had elected to put her in a shoulder spica she would have still been immobilized. The point about these active movements is that they are active—no one pulls the arm or elbow around; the patient provides the active power. Secondly, the movements should be virtually painless and kept within the painless range. The aim of treatment is to move the shoulder frequently—not widely.

The case in Fig. 15 is a little more complex. This was a 67 year old woman with a dislocation of the shoulder plus a displaced fracture of the greater tuberosity. After the dislocation was reduced it was suggested that a collar and cuff and active movements be the regime. Since at least one prominent text-book nominates that these injuries require an abduction spica, the collar and cuff proposal was greeted with some skepticism by the internes. In the first place, since the lady was over 45, recurrent dislocation could be disregarded so there was no need to immobilize the shoulder on account of the dislocation. To decide the point about the optimum position for the fracture the arm was abducted and placed against the chest. Now the views, Figs. 16 and 17, are not strictly comparable, yet there is no suggestion that the arm at the side was allowing the rotator muscles to distract the fracture. This lady does not have a normal shoulder now—but she does have a painless shoulder with an excellent social range. The shoulder fails on precise physical examination, yet from the patient's point of view it permits her a full range of activity.

The problem in most fractures immediately adjacent to the shoulder joint is not one of nonunion or malunion but of shoulder stiffness. The patient should be treated for joint disfunction and not for bony alignment.

The foregoing material, while containing nothing new, is intended to re-emphasize certain fundamental points in traumatic surgery—points which are frequently forgotten or overlooked no matter how often we relearn them. If every patient were thoroughly examined at the time of injury, if priorities were accurately assigned, if the patient's pain and fright were acknowledged and considered and if every patient were frequently seen and encouraged till his injured limb was again working well, the standard of traumatic surgery would rise far higher than any intensive widespread training would achieve. We get into trouble not because of what we do not know, but because of what we overlook or neglect.

The Regulation of Shoe Fitting Fluoroscopes *(continued from page 10)*

Most of these bodies have introduced the regulations under previously existing legislation such as Public Health Acts, Sanitary Codes, etc., though a few have had special legislation passed. Following the introduction of regulations in various states and cities, the manufacturers of shoe fitting machines have made very considerable improvements in their recent models. Most of the machines made since the introduction of regulations incorporate the main features of the regulations. The manufacturers have co-operated in schemes to renovate the older machines to make them conform to the standards.

Closely associated with regulation is the need for inspection. This has mostly been done by sanitary inspectors who have had some additional training in this type of work. The necessary instruments and techniques are described by C. Garrett in Occupational Health Review, December 1951. The total cost of these instruments is about $700 to $1000.

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A Pilot-Model Industrial Dental Programme

(continued from page 7)

8. While a dental service should be closely co-ordinated with an industrial health service it should not be subordinated to that service by becoming a section of it under its technical director. It should report directly and independently, but in association with the medical service to the administration of the industry. This maintains the working relationship between the medical profession and the dental profession which is perpetuated by the universities in their training, and works so well in private practice.

The Role of Trauma in Arthritis

(continued from page 14)

condition continued unabated. A cervical and upper dorsal sympathetic ganglionectomy was performed. She had a good response, the hand became warm and pink and the oedema partially disappeared. The pain was alleviated but returned in a few weeks time. Her disability continued. She had developed extreme osteoporosis of the carpals and metacarpals. After six months the carpal and radio-carpal joint spacing was markedly narrowed and irregular. A radiological diagnosis of traumatic arthritis was made. Finally, despite plaster immobilization, rest, and several courses of cortisone, a formal wrist fusion was necessary to alleviate the pain.

As may be appreciated, the role of trauma in the production and aggravation of the various forms of arthritis is a complex problem. This problem is constantly being brought to the attention of those of us who deal with Compensation Medicine.

Diagnosis and Treatment of External Diseases of the Eye

(continued from page 17)

scarring of the cornea, which, if they occur in the pupillary area, will result in gross visual defect.

Perforating wounds of the cornea are major injuries and are often recognized by the appearance of a pear-shaped pupil, thus formed because a portion of the iris is prolapsed or caught in the corneal wound. This type of injury may easily result in loss of the eye, and occasionally both eyes through sympathetic ophthalmia. Perforating wounds should be treated with an antibiotic, padded lightly and referred to a specialist.

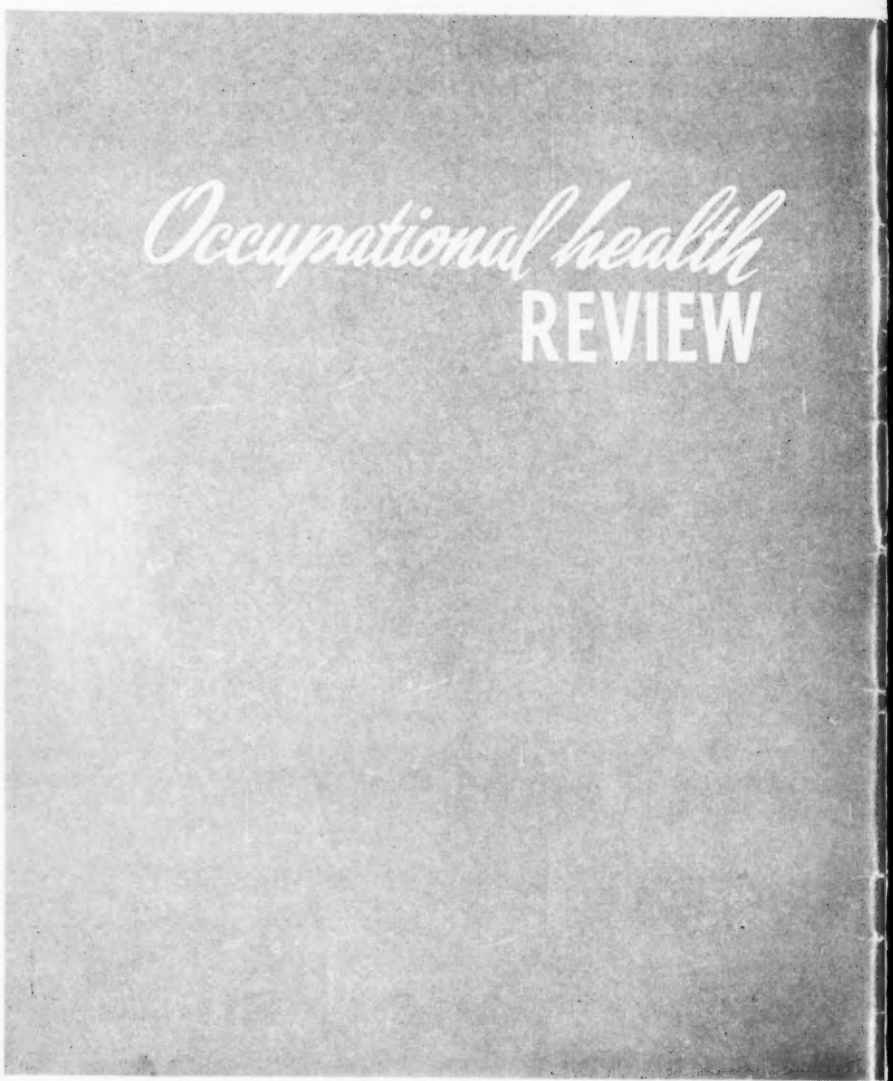
Cataracts or lens opacities occur under four circumstances: 1) congenitally, 2) secondary to other eye pathology, 3) as a senile degenerative change or 4) they may be traumatic in origin. If you find the characteristic grey-white colour in the pupillary area, following an eye injury, you must suspect a traumatic cataract. The penetration of the cornea with a sharp object, or an intra-ocular F.B. may have caused the cataract. Don't assume that the cataract was pre-existent, if there are no external signs of injury. A small piece of metal travelling at high speed as from a chisel or power tool, can penetrate the cornea and injure the lens without the patient's knowledge. Most retained intra-ocular F.B.'s destroy the eye. Refer these injuries to a specialist.

SUMMARY

In the foregoing article a number of the more common external conditions of the eye have been discussed. Most of them you have already seen, or will see in the course of practice. The purpose of this article has been to present information which will enable you to diagnose the condition when you see it and handle it in a manner which is in the best interests of your patient and yourselves. At least you should recognize what you can treat successfully yourselves, and what you should not treat yourselves. Finally, one word of caution about Cortisone. You are aware of the marvelous decongestive effects of this therapy. The condition you are treating must be correctly diagnosed before cortisone is prescribed for home use. One patient who received cortisone for an acute eye condition died in 48 hours from a ruptured diverticulum. The existence of the diverticulitis was not known.

Further, we know that cortisone is harmful in the early stages of a virus eye infection. Although the patient's eye symptons have abated, virus keratitis may progress and perforate with loss of the eye—through the use of cortisone.

Edmond Cloutier, C.M.G., B.A., L.Ph.
Queen's Printer and Controller of Stationery, Ottawa
1955


Occupational health
REVIEW